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Memoirs of the Department of Agriculture in India

THE MORE IMPORTANT INSECTS INJURIOUS TO INDIAN AGRICULTURE

BY

H. MAXWELL-LEFROY, M.A., F.E.S., F.Z.S

Imperial Entomologist

AGRICULTURAL RESEARCH INSTITUTE, PUSA

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Imperial Entomologist.

INTRODUCTION.

In the following pages, the insects known to be injurious to crops in India, are described briefly in systematic order. No list of injurious insects exists at present, and this list is published with a view to fixing definitely the nomenclature and status of such pests as have already been described and giving such details as are of value to working Entomologists. There are, unfortunately, several species of major importance, which cannot be included as their generic or specific denomination is not known. These will be included in the next list. New pests will certainly also be found, but this list is complete enough to be of value to working Entomologists interested in economically important species, especially those of the tropics. To those who study the insect pests of the tropics or of almost any locality outside Europe and the United States, it is a matter of regret that there is so little information as to what insects are destructive in these countries. Information about them has to be sought in numerous reports, bulletins and articles, and it is no easy matter to find in what countries a particular species occurs as a pest and what its habits and status there are. This memoir is published to supply this information about India and to give a useful basis for future work. It is proposed to publish a supplementary list when the material is available.

Nomenclature.—I have given the most accurate designation afforded by the literature at my command. That these

designations will not remain accurate will be evident to those who have observed the changes made, for instance, by Sir George Hampson in his new catalogue of the *Noctuidæ*. The literature references indicate the original description wherever possible, the relevant passages in the volumes of the Fauna of India and other literature in India, such as Indian Museum Notes.

Distribution.—I am indebted to Lieut-Colonel Alcock, C.I.E., I.M.S., F.R.S., Superintendent of the Indian Museum, for permission to compile the information showing the localities from which specimens in the Museum were obtained, the work being done by Mr. C. A. Paiva. I have not stated localities in detail, but have given the distribution as I believe it to be from all the records at my disposal, including the Pusa collections and the available literature. In India, there is a fairly sharp distinction between the Fauna of the plains proper and that of the hills (2,500 feet and upwards). This distinction is a very real one to those who have worked at insects in India ; for each species that has been described from the plains, there are probably ten described from the hills ; but in this case species of economic importance are usually " plains species, " in some cases common to both hill and plain localities. Where the distribution is given as common in the plains, this does not necessarily mean that the insect will be found in every locality but in any locality in the plains where its food plant is cultivated. Species known to be confined to particular tracts are expressly stated to be so, and in some instances a species, though widely spread, has not been found as a *pest* everywhere in India where it occurs as a normal member of the fauna. Where data are insufficient, I have preferred to assume the wide distribution rather than to state that the insect is restricted to a particular tract.

Biology.—This information is a summary of the most important facts. Every working economic Entomologist gets a definite idea of each important species and tries to fix its biological characteristics ; I have simply put down the mental picture I form of each species derived from numerous observations and reports. The information about hibernation is equally a very

careful summary of such facts as are known. It will probably be some time before we can generalize about the influence of climate, etc., on the activities of insects in India. As a general rule, in most parts of India, there are three more or less well-defined seasons in the plains ; the cold months (November 15th to March 15th), the hot dry months (March 15th to June 15th), the rainy months and succeeding hot moist weather (June 15th to November 15th). The relative duration of these periods varies greatly in different parts ; in the Punjab the cold weather is long and more intense, the hot weather lasts until well into July when the rains break, and the rains may be scanty. In localities below the East and West Ghauts, in Lower Bengal, Eastern Bengal and the valleys of Assam, the cold weather is less intense, the succeeding months are far more moist than elsewhere, and the period of moist warm weather is very much longer. The activities of insects are in this latter case of longer duration, and hibernation may be unknown. The facts then are best expressed by a reference to these three seasons, the cold weather, the hot dry weather, the warm moist rainy months. No attempt is made to discuss the hibernation of these species in the hills.

It is impossible to avoid a reference here to the fascinating subject of insect life zones in India ; could we map the various life zones for insects, as is done for instance for plants, we could give the distribution and habits of insects according to such zones. Unfortunately the information necessary to map such zones is not forthcoming as yet, and it must be long before we can hope to be in a position to commence such an enquiry. We may perhaps draw attention to the very generally uniform conditions that prevail over the great cultivated areas. Though the extremes are very distinct, the warm moist rice areas shade into the colder dry wheat areas ; the crops are well distributed over a great part of the cultivated areas of India, and the biological distinctions between distinct areas is far less marked if we consider only our pests than if we consider insect life as a whole. At a later date it may be possible to discuss insect life zones in general ; if we bear in mind the inevitable differences in the behaviour of a pest due to varying

conditions of moisture, heat, etc., we can apply the facts given below to the great majority of the areas in which crops are cultivated.

Food Plants.—The known cultivated foodplants, as well as wild ones, are enumerated ; much has yet to be learnt under this head.

Status.—This section is the most difficult to express and the views adopted would possibly not be endorsed by other Entomologists in India. They sum up the total of my experience from personal observation, from the work of assistants, and from specimens sent in from all parts of India. With so enormous an area to consider and with so little information from other observers, it is inevitable that I should state my personal ideas of the importance of each species ; these ideas automatically adjust themselves to fresh facts, and in further years of work, the views now expressed will doubtless undergo much modification. I believe they are in the main near to the truth.

This memoir was compiled originally as a working basis at the time that I wrote "Indian Insect Pests," and is published as an adjunct to that volume. I have freely used all the records at my disposal, and it is not possible to acknowledge them in detail. The work of Ratiram Khamparia, Entomological assistant, in the Department of Agriculture, Central Provinces, and of Lala Vishwanath Sahai, Entomological assistant in the Department of Agriculture, Punjab, have been included ; my staff has also been able to supplement my records. I owe much to the specimens sent in at the instance of the Directors of Agriculture of all Provinces by District officers, Farm Superintendents and officers of the Departments of Agriculture. My thanks are especially due to those Entomologists in Europe and elsewhere who have liberally given their time to the identification of insects, which offer few points of interest, not being new or rare. Mons. Desneux has very kindly examined the termite ; the specimens of Coleoptera sent me by Mr. H. E. Andrewes, have enabled me to correct the nomenclature of some species apparently wrongly identified in Indian Museum Notes ; Mr. E. Meyrick has

examined the Pterophoridæ and Tineidæ, describing the new species ; Mons. Schouteden very kindly worked over the Aphides.

It is proposed to issue correction slips as the revision of Indian groups alters the nomenclature here employed ; an isolated worker in a far country is largely dependent on the periodical revisions of the many groups of insects included in this list. Corrections must be numerous and, as work progresses, additions must be made to this list. For the convenience of Indian students a list of the more important insects, chiefly Curculionidæ and Diptera, whose identification is at present impossible, has been printed separately : I hope to include these in a supplementary list at no very distant date, but as the completion of this catalogue would entail its indefinite postponement until the last new pest had been identified, I prefer to publish this incomplete one as a commencement.

H. MAXWELL-LEFROY.

ACRIDIIDÆ.

67. CHROTOGONUS TRACHYPTERUS.—Blanch., Ann. Soc. Ent. Fr. V. 607.

Indian Museum Notes, I—V (Fig. i*).
Indian Insect Pests, p. 220 (Fig. i).

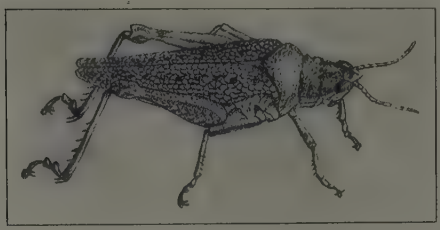

FIG. 1. CHROTOGONUS TRACHYPTERUS.
×2.

Male 13 m. m. Female 19 m. m. (Vertex to pygidium.) Flattened, the dorsal surface and tegmina roughened and earth colour. A variable species; the destructive individuals are probably all of this species, though it is uncertain how many species are common in the plains.

Distribution.—The plains and lower slopes of the hills.

Biology.—Eggs in clusters in soil. Nymphs and imago on soil, in fallow fields, in newly-sown land, in waste land. No definite hibernation, development checked in cold weather, broods irregular. Found throughout the year.

Food Plants.—Young indigo, opium, lucerne, cotton, bhinda, groundnut, castor, tobacco.

Status.—A major pest, responsible for much loss in young crops. General and of irregular occurrence, influenced by climatic conditions.

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* The following contractions are used to denote figures :—
e = egg, l = larva, n = nymph, p = pupa, i = imago. [H. M. L.]

ACRIDIIDÆ—(*contd.*)

186. ATRACTOMORPHA CRENULATA.—Fabr.,
Indian Museum Notes, III, p. 21.

FIG. 2. ATRACTOMORPHA CRENULATA.

Male, 24—27 m. m. Female, 32—35 m. m. (frons to wing apex). Colour green, stippled lighter. Lower wings pink. Face looking down, prosternum laminate, antennæ not flattened.

Distribution.—Hills and plains, probably universal. Ceylon, Burma, Java.

Biology.—Eggs in soil in clusters. Nymphs and imago on dry soil in fallow fields, young crops and waste lands. No hibernation, development checked in colder localities. Broods irregular, found throughout the year.

Food Plants.—Tobacco seedlings, *Compositæ.*

Status.—A major pest, responsible for much loss in young crops. General and of regular occurrence.

ACRIDIIDÆ—(*contd.*)

47. HIEROGLYPHUS FURCIFER.—Serv. *Orth.*, p. 677.
Indian Museum Notes, II, p. 30 (Fig. i.)
Indian Insect Pests, p. 119 (Fig. e. i.).

FIG. 3. HIEROGLYPHUS FURCIFER. NORMAL FORM.

FIG. 4. HIEROGLYPHUS FURCIFER. MICROPTEROUS FORM.

Male, 23—36 m. m. Female, 36—50 m. m. (frons to pygipium). Green or dry grass colour. Indented black lines on the prothorax, no other markings. Hind tibiæ blue.

A micropterous form occurs commonly with intermediates to the macropterous form.

Distribution.—In suitable localities in Bengal, the United Provinces, Central Provinces, Mysore, Hyderabad, the Bombay Presidency and Madras, Burma (Bhamo).

Biology.—Egg mass in soil, November to June. Nymphs and adults in wet vegetation in rains. One brood annually.

Food Plants.—Grasses, *rice*, cane, small millets.

Status.—Major local pest, of regular occurrence.

ACRIDIIDÆ—(*contd.*)

46. ACRIDIUM SUCCINCTUM.—Linn. Cent. Ins., p. 15.
Indian Museum Notes, I—V (Fig. i.).
Indian Insect Pests, p. 214 (Fig. e. n. i.).
Memoir, Agricultural Department, Ent. I (Fig. e. n. i.).

FIG. 5. ACRIDIUM SUCCINCTUM.

Male, 59—68 m. m. Female, 74—80. m. m. (frons to wing apex). Colour variable ; lower wing red. Tegmen lightly marked in fuscous, thorax narrow and scarcely indented ; never unicolorous, prothorax and tegmen striped.

Distribution.—From Gujarat to Kanara on the West Coast, to Bengal, Assam and Burma, in forest areas. Principally in forests of Kanara, Goa, and the Western Ghauts.

Biology.—Eggs laid in soil in clusters, at first burst of monsoon. Nymphs during rains, imago flying October-November to June.

Food Plants.—Grasses, grain crops, forest trees, palms.

Status.—Occasional major pest, local and infrequent.

ACRIDIIDÆ—(*concld.*)

66. ACRIDIUM (SCHISTOCERCA) PEREGRINUM.—Oliv.
Voy. Empire Ottoman, II, p. 224.
Indian Museum Notes, I—V (Fig. i).
Indian Insect Pests, p. 214 (Figs. e. n. i.).
Memoir, Agricultural Department, Ent. 1 (Fig. i).

FIG. 6. ACRIDIUM PEREGRINUM.

Male, 62—65 m. m. Female, 62—78 m. m. (frons to wing apex). Unicolorous, yellow, pink or purple-red, black speckled. Tegmen spotted in many black speckles. No longitudinal bands of colour. Prothorax narrow, transversely indented.

Distribution.—Northern India, Baluchistan to Himalayas and Bengal, Arabia, Persia, Cyprus, Algeria, Egypt. Stated to originate in South America.

Biology.—Eggs in clusters in dry soil or sand. Nymphs in armies moving. Imago flies in swarms. Two broods yearly of varying date.

Food Plants.—Crops and trees.

Status.—Major pest, local and of irregular occurrence.

GRYLLIDÆ.

51. BRACHYTRYPES ACHATINUS.—Stoll. Spect. Gryll. Achet., p. 4.

Indian Museum Notes III, 4-45 (Fig. i.).
Indian Insect Pests, p. 224 (Fig. i.).

FIG. 7. BRACHYTRYPES ACHATINUS.

31—43 m. m. (frons to pygidium).

Uniform deep brown.

Distribution.—In hills, plains near Himalayas, Burma, all Eastern Asia.

Biology.—Subterranean, imago rarely on surface. Found throughout the year.

Food Plants.—Weeds, lucerne, indigo, tobacco.

Status.—Minor local pest, destructive to young crops and to tobacco.

GRYLLIDÆ—(*concld.*)

260. GRYLLOTALPA AFRICANA. Pal. B. Insect rec en Afrique et en Amer., p. 229 (1805).
Indian Insect Pests, p. 224 (Fig. i).

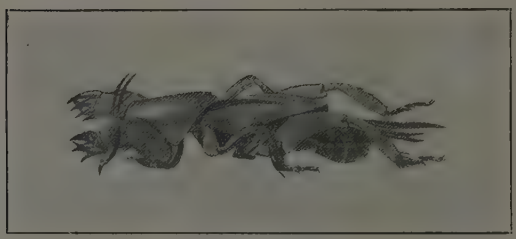

FIG. 8. GRYLLOTALPA AFRICANA.

22—25 m. m. (frons to wing apex). Deep brown to black. Digging leg without tubercle (cf. *G. vulgaris*).

Distribution.—Africa, New Holland, and throughout tropical Asia. (The Himalayan species is the palæarctic *G. vulgaris.*)

Biology.—In deep burrows in soil. Imago flies at night. Hibernation uncertain.

Food Plants.—Probably carnivorous, injuring crops by its burrowing. (Indigo, fruit trees, tree cottons, tobacco.)

Status.—Minor local pest.

LOCUSTIDÆ.

170. SCHIZODACTYLUS MONSTROSUS.—Drury. Ill. Exot. Ent. II. Pl. 43, Fig. 1.
Indian Museum Notes, I—III (Fig. i).
Indian Insect Pests, p. 224 (Fig. i).

FIG. 9. SCHIZODACTYLUS MONSTROSUS.

41—52 m. m. (frons to apex of wing). The tegmina spirally rolled at the apex, the tarsi with flat expansions.

Distribution.—Behar generally. Sambalpur, Duars, Goalpara, Sibsagar, Sikkim, Lucknow, Allahabad, Karachi, Nilgiris, Nuddea, Murshidabad, Mirzapur, Krishnagar, Multan, Baluchistan, Persian Frontier.

Biology.—In very deep burrows in sandy or loamy soil. Hibernation uncertain. Imago can fly, but is rarely found above soil.

Food Plants.—Probably a carnivorous insect that rarely eats vegetable matter. (Injures fruit trees and tobacco.)

Status.—Local pest, serious in a few localities.

NEUROPTERA.

(TERMITIDÆ.)

198. TERMES OBESUS.—Ramb., Hist. Nat. Neur., p. 304 (1842).

T. *taprobanes*. Indian Museum Notes, III—V. (Figs. n. i.).

„ „ Indian Insect Pests, p. 228 (Figs. n. i.).

FIG. 10. TERMES OBESUS. WINGED QUEEN.

FIG. 11. TERMES OBESUS. WINGLESS EGG-LAYING QUEEN.

The common "White-ant" of the Plains.

Distribution.—India, common throughout the Ganges Valley, Cuttack, Nagpur, Bombay Presidency, Madras.

Biology.—Subterranean, and making mounds at the surface. Winged forms appear only at definite times in the rains. Active throughout the year.

Food Plants.—Timber trees, cane, wheat, groundnut, sunflower, mango, oats, safflower, juar, strawberry, khorasani, moth.

Status.—Major pest of general occurrence.

TENTHREDINIDÆ.

54. ATHALIA PROXIMA.—Klug. Mag. Ges. Naturf. Bul., Vol. 7, p. 130.

Indian Insect Pests, p. 152.

The only known destructive sawfly in the plains. 6 m. m. (frons to pygidium). Head, meso and meta-notum black. Pronotum, abdomen, shining orange. Wings smoky hyaline, nervures black.

Distribution.—India, Calcutta, Behar, Cawnpore, Lahore, Nagpur, Poona, Surat, Baroda, Assam Valley.

Biology.—Egg in tissue of margin of leaf. Larva on the plants, hiding in soil by day. Pupa in light cocoon between two leaves, or in soil. Imago day flying. Active in cold weather only, usually passing the hot weather and rains as a resting larva, in an earthen cocoon.

Food Plants.—Field and garden *Cruciferæ.*

Status.—Minor pest, rarely injurious.

FORMICIDÆ.

221. DORYLUS ORIENTALIS.—Westw. P. T. S., V., p. 72. Bingh. F. Ind., Hym. II, p. 4. Indian Insect Pests, p. 231 (Fig. worker).

FIG. 12.
DORYLUS ORIENTALIS WORKERS.

Worker, brownish-yellow, pedicel one jointed, eyes absent, antennæ nine jointed. 2·5—3, 5—6 m. m. *Male*, a large wasp-like insect ; second joint of flagellum beneath not pubescent, 17—23 m.m.

Distribution.—Malay Peninsula, Borneo, Java ; throughout India, Burma and Ceylon.

Biology.—In nests below ground ; come up to surface as termites do. Males fly at night. Females unknown.

Food Plants.—Vegetable crops.

Status.—Sporadic local pest of vegetable gardens.

FORMICIDÆ—(*concld.*)

262. HOLCOMYRMEX SCABRICEPS.—Mayr. Verh. Zool-bot, Ges. Wien. XXVIII, p. 672.
Bingham, F. Ind. Hym. II, p. 282.
Rothney, Tr. Ent. Soc., London, 1889, p. 367 (habits).
Indian Insect Pests, p. 232.

Worker. Pedicel two-jointed. Antennæ 12-jointed, clypeus bicarinate and bidentate, produced between bases of antennæ; pronotum unarmed; erect hairs simple. Head, thorax and pedicel reddish ferruginous; abdomen dark brown. Head finely striate, abdomen smooth. 3·5—7 m. m.

Distribution.—Punjab and Bengal. Irregularly throughout India. (Bingham.)

Biology.—In nests close to the surface of the soil.

Food Plants.—Seeds of grass, rice and kangni.

Status.—Minor pest.

SCARABAEIDÆ (Dynastides).

126. Oryctes rhinoceros.—Linn.

Indian Museum Notes, II, III, V (Fig. i).
Indian Insect Pests, p. 207 (Fig. i).

Fig. 13.
Oryctes rhinoceros. Male.

Fig. 14.
Oryctes rhinoceros.
Female.

Male, 43 m. m. (apex of mandible to pygidium). A single backwardly curved horn on head, two teeth on prothorax at rim of a hexagonal depression. Elytra punctate and faintly striate. Colour black above, deep brown below, with ferruginous to deep brown hair.

Female. Similar but smaller, horn reduced to a tubercle, depression less marked.

Distribution.—India, Burma, Ceylon, Straits Settlements.

Biology.—Larva and pupa in manure heaps and decaying woody matter. Imago flying at night, length of life-history unknown, probably one year.

Food Plants.—Palms, injured by the imago.

Status.—Sporadic minor pest.

SCARABAEIDÆ (Cetoniides).

264. Chiloloba acuta.—Wied. Zool. Magazine, II, 1, p. 87.
Indian Insect Pests, p. 200.

12—14 m. m. (clypeus to apex of elytra). Bright metallic green, finely pilose above, with tufts of white hair below.

Distribution.—Wardha, Nagpur (R. R. K.), Kanara (Bell coll.), Dehra Dun, Chupra. Probably widespread in India.

Biology.—Imago appears yearly. The life-history is unknown and probably occupies one year.

Food plants.—Juari, kutki.

Status.—Local minor pest, injuring the flowers and causing loss of grain.

COCCINELLIDÆ (Epilachnides).

131. Epilachna viginti-octo-punctata.—Fabr.,
Indian Museum Notes, III, 6, p. 9 (Fig. i).
Haymann, Report of Cawnpore Farm, 1903.
Indian Insect Pests, p. 204 (Fig. i).

Fig. 15.
Epilachna viginti-octo-punctata.

7 m. m. (Clypeus to apex of elytra). Colour deep red; above, finely pilose. Fourteen black spots on each elytron. It is uncertain how many species are destructive or whether, as is possible, there is but one destructive species which is variable in colour and spotting.

Distribution.—Throughout the plains of India.

Biology.—Eggs in clusters on plant. Larva feeding openly on plant. Pupa suspended by tail. Imago day feeding. Hibernation as imago. Found in hot weather and rains.

Food Plants.—Brinjal, potatoes and wild *Solanaceæ;* cucurbitaceous plants.

Status.—Minor pest of vegetable crops.

Coccinellidæ—(*contd.*)

28. Epilachna dodecastigma.—Muls.,
Indian Museum Notes, IV, p. 2.
Indian Insect Pests, p. 204.

Fig. 16. Epilachna dodecastigma.

Larger, six spots on each elytron. Doubtfully distinct from the last.

Distribution.—General in plains.

Biology.—Egg in clusters, larva on plant, leaf-eating. Pupa on plant. Imago leaf-eating. Hibernation as imago.

Food Plants.—Cucurbitaceous plants, brinjal.

Status.—Minor pest of vegetable crops.

BUPRESTIDÆ.

60. SPHENOPTERA GOSSYPII.—Kerr., Ann. Soc. Ent. Belge. 36, p. 195.
Indian Museum Notes, II, p. 33 (Fig. i).
Indian Insect Pests, p. 100 (Fig. l, p. i).
Agric. Journ. India, Vol. I, p. 58 (Fig. l, p. i).

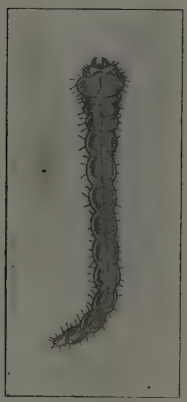

FIG. 17.
SPHENOPTERA GOSSYPII.

FIG. 18.
SPHENOPTERA GOSSYPII.

9 m. m. Sides parallel, head as large as the thorax, eyes prominent. Deep bronzy black above and below. (Smaller than the closely similar species that attacks tur.)

Distribution.—Bombay Presidency, Central Provinces, Punjab, Behar rarely.

Biology.—Larva a stemborer in small woody stems. Pupa in stems. Hibernation in colder localities only. Imago living through hot weather. About four broods from August to January.

Food Plants.—Cotton.

Status.—Local minor pest of cotton, of regular occurrence.

CANTHARIDÆ.

40. CANTHARIS TENUICOLLIS.—Pall. Icon. Ins., p. 92.
? C. ruficollis, Fabr. Syst. El. II, p. 78.
(*Epicauta*). Indian Museum Notes, II, V (Fig. i).
? C. ornata, Cast. Hist. Nat. Coll. II, p. 272.
Indian Insect Pests, p. 205 (Fig. i).

FIG. 19.
CANTHARIS TENUICOLLIS.

12-13 m. m. (occiput to apex of elytra). Head, elytra and abdomen metallic green, prothorax reddish-brown, compressed in front.

Distribution.—Surat, Ratnagiri, Cawnpore, Lahore, Nagpur, Berar, and general in the Central Provinces.

Biology.—Imago appears in September-October in large numbers. Life-history unknown. Imago feeds at night on anthers and pistils of flowers.

Food Plants.—Juari, maize, rice, kutki, and other small millets.

Status.—Local pest of considerable importance.

CANTHARIDÆ—(*contd.*)

39 CANTHARIS ROUXI.—Cast. Hist. Nat. des. Col. II, p. 273.
Indian Museum Notes, II, V (Fig. i).
Indian Insect Pests, p. 205 (Fig. i).

FIG. 20.
CANTHARIS ROUXI.

16—17 m. m. (occiput to apex of elytra). Head reddish-brown, elytra dull brown, thorax black, the whole with short brown pubescence.

Distribution.—Central Provinces, Kanara, Behar.

Biology.—Imago appears in August—October. Life-history unknown; feeds by night on anthers and pistils of flowers.

Food Plants.—Rice, small millets.

Status.—Serious local pest.

CANTHARIDÆ—(*concld.*)

50. MYLABRIS PUSTULATA.—Thunb. Nov. Ins. Spec. Part VI.
? M. Sidæ, Fabr.
? M. Phalerata, Pall.
Indian Museum Notes, I—V (Fig. i).
Indian Insect Pests, p. 205 (Fig. i).

FIG. 21.
MYLABRIS PUSTULATA.

17—25 m. m. (occiput to apex of elytra). Black, with black pubescence. Elytra with two broad bands and an anterior spot of orange. Size and banding very variable. This is a variable species, and it is not certain how far more than one species are concerned. Apparently, one variable species is found throughout the plains and lower hills. The synonymy of this widespread insect is in confusion.

FIG. 22.
MYLABRIS PUSTULATA.

Distribution.—Throughout the plains and lower hills of India; probably also South Europe, Egypt, China.

Biology.—Imago appears in numbers in August to October feeding by day on flowers. Eggs laid in masses on ground or grasses, larva active. Further history unknown.

Food Plants.—Flowers of malvaceous, cucurbitaceous and leguminous crops and vegetables.

Status.—Minor local pest, sporadic.

CHRYSOMELIDÆ.

(GALERUCIDES.)

11. AULACOPHORA FOVEICOLLIS.—Kust. Kaf. Eur. XXVIII, p. 100.
Abdominalis, Indian Museum Notes, I, II, IV (Fig. i).
Indian Insect Pests, p. 164, 200 (Fig. i).

FIG. 23.
AULACOPHORA FOVEICOLLIS.

6 m. m. (occiput to apex of elytra). Orange brown; pronotum finely punctured and transversely indented; elytra finely punctured. Black below except prosternum and apical portion of the terminal segment.

Distribution. — Throughout the plains of India.

Biology.—Imago throughout the year on plants. Life-history unknown.

Food Plants.—Cucurbitaceous plants.

Status.—Minor pest of vegetables.

CHRYSOMELIDÆ—(*contd.*)

(HISPIDES.)

41. HISPA AENESCENS. Baly.—Journ. As. Soc. Be. LV, Pt. II, p. 412 (1886).
Indian Museum Notes I, IV, V (Fig. i).
Indian Insect Pests, p. 114 (Fig. i).

FIG. 24.
HISPA AENESCENS.

5 m. m. (occiput to apex of elytra). Steel blue to black. A single four branched spine (almost four single spines from one base) at each side in front and a single spine at each side behind, on the prothorax, which is otherwise unspined. Elytra spined.

Distribution.—Assam, Burma, Bengal, Malabar, Kulu.

Biology.—Eggs laid in leaf, larva mining in leaf, pupa in leaf, imago flying, leaf-eating. Hibernation as imago, breeds chiefly in rains.

Food Plants.—Rice, grasses.

Status.—Major pest, local and sporadic.

HISPIDES—(*contd.*)

124. LEPTISPA PYGMÆA.—Baly. Cat. of Hisp. 1858, p. 2. Indian Museum Notes, III, IV, V (Fig. i). Indian Insect Pests, p. 201 (Fig. i).

FIG. 25. LEPTISPA PYGMÆA.

Length 4 m. m. Narrow, sides nearly parallel, steel-blue, thorax and elytra punctured; no spines.

Distribution.—Poona, Malabar, Ceylon.

Biology.—Imago on leaves; life-history unknown.

Food Plants.—Rice and cane.

Status.—Local pest, with *Hispa aenescens.*

CERAMBYCIDÆ.

32. XYLOTRECHUS QUADRIPES.—Chevr. Mem. Soc. Sci. Liege, XVII, p. 63.
Dunning, Coffee Borer, Trans. Ent. Soc., 1868.
Taylor, White Borer, 1868, Madras.
Bidie, Ravages of Borer, 1869, Madras.
Gahan, F. Ind. Col. I, p. 245 (Fig. i).
Indian Museum Notes, III, IV (Fig. i).

FIG. 26. XYLOTRECHUS QUADRIPES.

Length 15 m. m. Black, abdomen banded in white : white or light yellow markings on elytra. Legs black, hind femora almost wholly red.

Distribution.—Coffee districts of South India, Assam, Burma, Siam, Tonkin (Gahan).

Biology.—Larva a tree borer. Pupa in bore. Imago emerges at one period, usually October.

Food Plants.—Coffee, (?) bamboo.

Status.—Serious local pest of coffee. The White Borer.

CURCULIONIDÆ.

6. MYLLOCERUS MACULOSUS.—Desb. des Log.
Indian Museum Notes, IV, p. 111 (Fig. i).
Indian Insect Pests, p. 112, 202 (Fig. i).

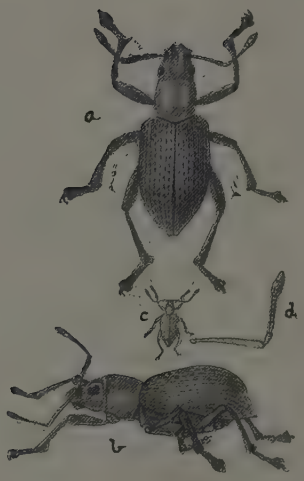

FIG. 27. MYLLOCERUS MACULOSUS.

Length 8—9 m. m. Clothed in scales white to light green in colour; the elytra appear punctate in rows owing to the absence of scales on these spots.

Distribution.—Bombay Presidency, Central Provinces, Punjab, Bengal, Cawnpore, Madras.

Biology.—Imago a leaf-eating weevil. Life-history unknown. Found throughout the year.

Food Plants.—Cotton, indigo, tur, maize, china.

Status.—Minor pest.

CURCULIONIDÆ—(*contd.*)

78. TANYMECUS INDICUS.—Fst.

Indian Museum Notes, III, IV (Fig. i).
Indian Insect Pests, p. 221 (Fig. i).

FIG. 28. TANYMECUS INDICUS.

4—6 m. m. Dark brown, clothed in light brown scales. Longitudinal lines on elytra.

Distribution.—Plains of Punjab, United Provinces, Behar.

Biology.—Imago found in June and November on soil. Life-history unknown. Hibernation uncertain.

Food Plants.—Wheat, gram, mangel wurzel, opium, juar, sunflower, cotton, maize.

Status.—Sporadic pest, locally important.

CURCULIONIDÆ—(*contd.*)

7. CYLAS FORMICARIUS.—Fabr. Ent. Syst. II, p. 549. (*C. Turcipennis.*) Schh. Gen. et. Sp. Curc., I, p. 369. Tryon. Queensl. Agric Journ., 1900, p. 176. Indian Insect Pests, p. 162 (Fig, i).

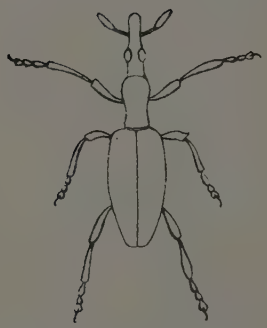

FIG. 29. CYLAS FORMICARIUS. (From Tryon).

FIG. 30. CYLAS FORMICARIUS. (From Tryon.)

6 m. m. (apex of rostrum to pygidium). Head, abdomen and elytra dark steel-blue; prothorax and antennæ reddish-brown; legs red except dilated femora which are black. Female has shorter, thicker antennal club.

Distribution.—Throughout the tropical and subtropical regions. Australia. In India, Poona, Madras, Surat, Pusa, Nagpur; probably widespread in the plains.

Biology.—Larva boring in tubers and succulent stems. Imago flies. Hibernation uncertain.

Food Plants.—Sweet potato.

Status.—Minor pest, sporadic and occasionally injurious.

CURCULIONIDÆ—(*contd.*)

204. CRYPTORHYNCHUS FRIGIDUS.—Schonh.

C. mangiferæ, Indian Museum Notes, I (Figs. l. p. i.).
" Indian Insect Pests, p. 174.
" Agric. Journ. India, I, p. 164 (Fig. i).

FIG. 31.
CRYPTORHYNCHUS FRIGIDUS.

7 m. m. Prothorax rugose, elytra coarsely punctured in lines. Dark-brown to black.

Distribution.—Assam, Bengal, United Provinces, Satara, Bombay. [Natal (Fuller), Hawaii (Kotinsky), are *C. mangiferæ*, Fabr.]

Biology.—Larva a borer in fleshy fruits. Pupa in bore. Imago long-lived, remaining torpid from August to May. One brood yearly in the plains.

Food Plant.—Mango.

Status.—Sporadic pest of regular occurrence.

CURCULIONIDÆ—(*concld.*)

141. RHYNCHOPHORUS SIGNATICOLLIS.—Chevr. Ann. Soc. Ent. Fr. 6, ii, p. 562 (1882).

R. ferrugineus Ol. Indian Museum Notes, II (Figs. l. p. i).

„ Indian Insect Pests, p. 208 (Figs. p. and i).

FIG. 32. RHYNCHOPHORUS SIGNATICOLLIS; imago and cocoon.

Length 34—36 m.m. (apex of rostrum to pygidium). Deep ferruginous brown, prothorax with black markings, elytra with longitudinal incised lines. Male rostrum shorter, with pilose pad on dorsal surface.

Distribution.—India, Ceylon, Burma, Straits Settlements. In India, general from Baluchistan to Assam and Malabar.

Biology.—Larva a borer in soft tissues as are the Calandrini generally. Pupa in tree in cocoon of twisted fibres. Imago flying at night. Length of life-history unknown.

Food Plants.—Cocoanut and other palms.

Status.—Local sporadic major pest.

NYMPHALIDÆ.

236. MELANITIS ISMENE.—Cram. Pap. Exot. I, pl. 26.
de N. J. A. S. Ben. LV, p. 237, (Fig. l. p).
M. & de N. Butt. Ind. I, p. 256, (Fig. i).
Bingh F. Ind. Butt. I, p. 159 (Fig. i).
Indian Museum Notes, V, p. 137, (Fig. i.)
Indian Insect Pests, p. 122, (Fig. i).

FIG. MELANITIS ISMENE.

Expanse, 70—80m.m. Brown, forewing with two large subapical black spots, with smaller white spots and an inner ferruginous border. Wet season form has the ferruginous markings smaller. Hindwing with a white-centred ocellus, replaced in wet season form with three or four white spots. Female paler, with more diffused ferruginous markings.

Distribution.—Africa, Madagascar, Mauritius, Bourbon. Indo-Malayan region to Australia. In India, common in Bengal, Central and Peninsular India ; also in Assam, Burma, Ceylon, rare in the Punjab and Himalayas, common in United Provinces (de N.).

Biology.—Egg singly on leaf. Larva on leaves, protectively coloured ; nocturnal. Pupa on plant. Imago, lower side of wings cryptically coloured to resemble dead leaf. Imago has a habit of flying round the roots of trees, under dense shade. Found in rains and later, two broods from June to November, possibly two in dry weather. Imago lives through winter. Dry and wet season form.

Food Plants.—Rice, juari, grasses.

Status.—Minor pest of rice.

Larva.—1½ inch long, grass green. Two erect processes on head and on anal segment, spiny. Prothorax constricted, abdomen rough and somewhat flattened, with white spots bearing hairs.

NYMPHALIDÆ—(*concld.*)

225. JUNONIA ALMANA.—Linn. Syst. Nat. ed. X, 1758, p. 472.
M. & de N. Butt. Ind. II, p. 68.
Bingh. F. Ind. Butt. I, p. 361.

FIG. JUNONIA ALMANA.

The only Indian Junonia with the ground colour rich orange-yellow. Expanse 54—62 m. m.

Distribution.—China, Japan, Malayan sub-region. In India throughout the plains and up to 6,000 feet. (de N.).

Biology.—Larva a typical leaf-eating caterpillar. Pupa on plant; chiefly found in rains and until November. Two broods from June to November. Dry and wet season form. Imago found throughout the year.

Food Plants.—Rice; principally wild plants.

Status.—An occasional component of swarms of caterpillars in early rains.

Larva.—1¼ inch; cylindrical, deep brown to black. Prothorax black with brown spots, with two pairs of spiny processes; rest of body with a dorsal, and three dorsolateral rows of spiny processes.

LYCÆNIDÆ.

202. CATOCHRYSOPS CNEJUS.—Fabr. Ent. Syst. Suppl., p. 430.
de N. Butt. Ind. III, p. 178.
Bingham. F. Ind. Butterflies II, p. 415.

Expanse 20—30 m. m. Violet blue, the male with two black spots at anal angle of hindwing, female with a broad brown border to both wings. Underside of wings grey, yellow tinged, with brown markings and marginal spots, two of which form ocelli.

Distribution.—China, Australia, South Sea Islands, Indo-Malayan region. In India, throughout the plains.

Biology.—Egg singly on leaf, larva feeding in pod. Pupa on pod. Several broods a year in plains.

Food Plants.—Tur, lobia, mung and *Phaseolus trilobus.*

Status.—Minor general pest.

Larva.—½ inch, flattened, green or pink, covered with white tubercles.

LYCÆNIDÆ—(*concld.*)

95. VIRACHOLA ISOCRATES.—Fabr. Ent. Syst. III, pt. I., p. 266.
de N. Butt. Ind. III, p. 477.
Indian Museum Notes I, 193, (Fig. 1, p. i).
Indian Insect Pests, p. 179. (Fig. l., p. i).

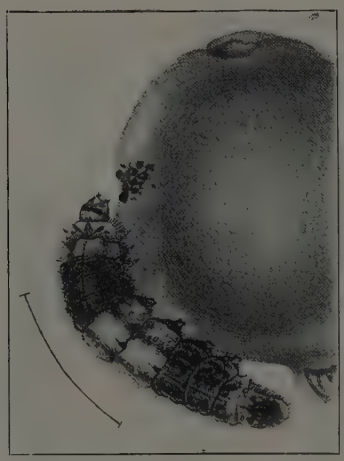

FIG. 35. VIRACHOLA ISOCRATES, larva on pomegranate.

FIG. 36. VIRACHOLA ISOCRATES.

Expanse, 38—45 m. m., 45—50 m. m. Male, upper side deep violet-blue with a gloss; female violet brown.

Distribution.—Common almost everywhere in the plains of India but the desert tracts (de N.).

Biology.—Eggs on calyx of flower. Larva in fruits. Pupa in eaten fruit. Imago flying. Very common in January and from then on till April.

Food Plants.—Pomegranate, loquat, guava, *Randia dumetorum* (de N.).

Status.—Local sporadic pest of cultivated pomegranate.

Larva.—$\frac{3}{4}$ inch; deep blackish-brown, the anterior segments largest; segments bristly and pitted; the last three segments flattened above.

PIERIDÆ.

PIERIS BRASSICÆ. Linn. Syst. Naturæ, ed. X, p. 467.
Bingham. F. Ind. Butterflies, II, p. 170, (Fig. i).
(*Mancipium nepalensis*). Ind. Museum Notes, II, p. 46.

FIG. 37. PIERIS BRASSICÆ.

Expanse 56—66 m. m. Creamy white, a black blotch at apex of forewing reaching to below middle of outer margin. Female with black blotches on forewing.

Distribution.—Europe, Asia, Japan, North Africa, India, Behar and near Himalayas.

Biology.—Eggs on leaf in clusters. Larva in groups, warningly coloured. Pupa on leaf. In plains only in cold and hot weather.

Food Plants.—Cruciferous plants.

Status.—Sporadic minor pest.

PAPILIONIDÆ.

139. PAPILIO DEMOLEUS.—L. Syst. Nat., ed. X, p. 464.
Bingham. F. Ind. Butterflies, II, p. 39.
Erithoniue de N. Indian Museum Notes, I, p. 93 (Fig. l. p. i).
Indian Insect Pests, p. 174 (Fig. l. p. i).

FIG. 38. PAPILIO DEMOLEUS.

Expanse, 58—75 m. m. Black, much marked with lemon-yellow. A red spot, usually bordered inwardly with blue and black, on the anal angle of the hindwing: a blue ocellus-like mark on black at the costal margin of the hindwing.

Distribution.—In India, hills and plains. The orange butterfly of Natal.

Biology.—Egg singly on leaf. Larva on the plant, feeding exposed; mimics bird dropping when young, protectively coloured when old; larva with warning eversible process. Pupa on plant. Found almost throughout the year in the plains. Hibernation as imago.

Food Plants.—Citrus plants. Bael (*Aegle marmelos*), ber (*Zizyphus jujuba*), and *Glycosmis pentaphylla.*

Status.—Minor pest of fruit trees.

Larva.—(Young) Dirty brown, with stumpy projections; a white blotch on the middle segments, dorsally. (Old) Deep green, above; with purple grey below, across the body at the junction of the thorax and abdomen, and stretching up obliquely on abdomen.

HESPERIIDÆ.

30. PARNARA (CHAPRA) MATHIAS.—Fabr. Ent. Syst. Suppl., p. 433.
Indian Museum Notes, V, 137 (Fig. i).
Indian Insect Pests, p. 122.

FIG. 39. CHAPRA MATHIAS. FEMALE.

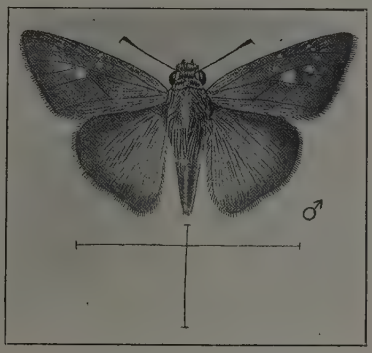

FIG. 39. CHAPRA MATHIAS. MALE.

Expanse, 27—33 m. m. Deep brown with an olive green sheen. Both wings with small white spots.

Distribution.—India, general in the plains. Africa, Java.

Biology.—Larva in rolled up leaf, eating all but the midrib. Pupa in rolled leaf. Found only in rains, two broods. Hibernation uncertain.

Food Plant.—Rice.

Status.—Minor pest.

Larva.—1½ inches. Green, with a white lateral line. The head with red marginal band.

Pupa.—Grass green, with white lateral line.

SPHINGIDÆ.

193. ACHERONTIA STYX.—Westw. Cab. Or. Ent. p. 88. Hmpsn. F. Ind. Moths, I, p. 67, (Fig. l. i). Indian Insect Pests, p. 160 (Fig. l., p. i).

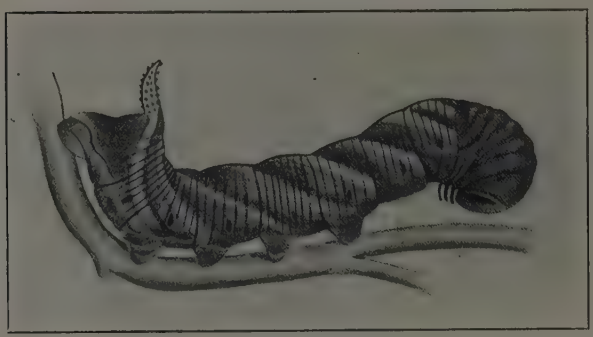

FIG. 40. ACHERONTIA STYX. LARVA.
(From Moore.)

Expanse 8—16 m. m. Thorax dark grey-blue, with a skull mark; abdomen yellow with black bands and a narrow medial blue-grey stripe. Forewing dark brown and grey. No black patch at base of hindwing and much yellow on the abdomen (cf. *lachesis*).

Distribution.—Asia Minor, China, Siam, Borneo, Celebes, Timor, Philippines, Japan, India, Ceylon. Throughout the plains.

Biology.—Egg singly on leaf. Larva typical leaf-eating caterpillar feeding concealed. Pupa in soil. No hibernation in plains, from two to four broods per annum, in (January), May, (August), and October, where food is available. Pupa may rest for three months.

Food Plants.—Til, kulthi, popat, a wild creeper.

Status.—Minor pest of til, rarely abundant.

Larva.—Green with oblique lateral stripes of yellow, edged with blue. Horn recurved and tuberculate.

Pupa. No external proboscis sheath; chestnut brown.

SPHINGIDÆ—(*contd.*)

230. HERSE CONVOLVULI.—Linn. Syst. Nat., I, p. 798. (*Protoparce*). Hmpsn. F. Ind. Moths, I, p. 103 (Fig. i). Indian Insect Pests, p. 159.

Expanse, 80—120 m.m. Grey, marked and clouded with black. Abdomen with lateral bands of pink and black. The grey wings and pink-banded abdomen are distinctive.

Distribution.—Europe, Africa, Asia, Borneo, Java, Celebes; in India, in plains.

Biology.—Egg singly on leaf. Larva feeding in concealment on leaves. Pupa on surface of soil. Hibernation uncertain, as pupa in the insectary.

Food Plants.—Sweet potato, Sunflower.

Status.—A minor pest, rarely injuriously abundant, occasionally in swarms.

Larva.—3½ inches long, green, horn yellow. Oblique lateral stripes on abdomen.

Pupa.—With an external proboscis sheath, red brown.

COSSIDÆ.

ZEUZERA COFFEÆ.—Nietn. Edin. New. Phil. Journ. XV, 1862, p. 36.
Hmpsn. F. Ind. Moths, I, p. 312.
Bidie, Rept. on Ravages of the Borer, 1869, Madras (Figs.).
Indian Museum Notes, II, III (Fig. l. p. i).

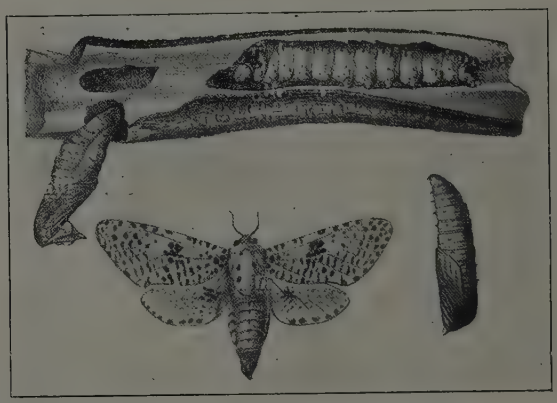

FIG. 41. ZEUZERA COFFEÆ.
Larva in coffee branch, pupa emerging, imago.

Expanse, male 40, female 46 m. m. Head and thorax grey, with black spots. Wings white with blue-black spots at edges. Abdomen, black with white hair.

Distribution.—Naga Hills, Rangoon, Ceylon, Borneo, Cachar (I. M.), Sikkim, Bhutan (Ddgn). Coffee districts of South India.

Biology.—Larva tree boring. Pupa in bore, emerging partially before escape of moth. ? One brood annually.

Food Plants.—Coffee, sandal.

Status.—Serious pest of coffee. 'The Red Borer.'

Larva.—2 inches, red-brown, smooth. Thoracic shield black.

LASIOCAMPIDÆ.

205. TRABALA VISHNU. Lef. Zool. Journ., III, p. 27.
Hmpsn. F. Ind. Moths, I, p. 421.
Indian Insect Pests, p. 158.

Male 50—60 m. m. Female 80—90 m. m. Male pale green, with an oblique line across wings. Inner area of hindwing white. Female yellow, an oblique line across wings, a red-brown patch on inner margin, a dark spot and an outer series of fuscous markings.

Distribution.—China, Java, India, Ceylon, Burma. In India principally Himalayan and sub-Himalayan.

Biology.—Eggs in double rows. Larva leaf-eating, hiding by day at root of plant. Pupa in cocoon of hairs on soil or on plant. Hibernation as pupa. About three broods in year, dependent upon food supply.

Food Plants.—Castor, Sal, Country almond.

Status.—Sporadic pest of castor, destructive when abundant.

Larva.—$2\frac{1}{2}$ inches. Clothed in grey and black hair ; head yellow with crimson patches ; prothorax bears a large tuft of black hair, projecting forwards.

HYPSIDÆ.

55. ARGINA SYRINGA. Cram. Pap. Exot. I, pl. v, Fig. c.
Hmpsn. F. Ind. II, p. 51. (*Arctiidæ*).
Indian Insect Pests, pp. 194, 148.
Agric. Journ. India. Vol. I, p. 187, (Fig. i.)

Expanse, 60—64 m. m. Head and thorax pinkish brown. Forewing pinkish brown with black spots ringed with yellow. Hindwing crimson with black spots.

Distribution.—Australia, India, Ceylon. In India, hills and plains.

Biology.—Eggs in clusters. Larva a typical leaf-eating hairy caterpillar, feeding exposed. Pupa in cocoon on soil. Hibernation as pupa.

Food Plants.—Sann hemp. and wild *Crotalaria.*

Status.—With *A. cribraria*, but rarer. Minor pest.

Larva.—Similar to *A. cribraria.*

Hypsidæ—(*contd.*)

56. Argina cribraria.—Clerck. Icon. Ins. II, pl. 54, Fig. 4.
Hmpsn. F. Ind. Moths, II, p. 51. (*Arctiidæ*).
Indian Insect Pests, pp. 148 193, (Fig. 1, p. i).
Agric. Journ. India, I, p. 187 (Fig. i).

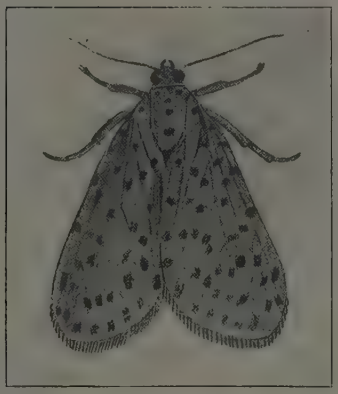

Fig. 42. Argina cribraria.
Resting attitude.

Expanse, 35—50 m.m. Male smaller. Head and thorax orange yellow; forewing orange yellow, with black spots ringed with dull grey. Hindwing orange with black spots.

Distribution.—Mauritius, China, New Guinea, India, Ceylon, Burma. Common in the plains.

Biology.—Eggs in clusters. Larva a leaf-eating hairy caterpillar, feeding exposed. Colouration warning. Pupa in thin cocoon on soil. Hibernation as pupa. Found chiefly in rains, depending upon food supply. Five or more broods before cold weather.

Food Plant.—Sann hemp.

Status.—Sporadic minor pest of Sann. Injurious when abundant.

Larva.—1 inch. Head reddish-brown, shining. Dorsal surface of body white, with lateral black line, black lines and patches entering and crossing the white. A lateral yellow line, with an orange spot in each segment. Hairs black above, light below.

ARCTIIDÆ.

136. DIACRISIA OBLIQUA.—Wlk. Cat. III, 679.
Hmpsn. Lep. Phal. III, p. 289.
Hmspn. F. Ind. Moths, II, p. 7 (Male only).
Indian Insect Pests, p. 193 (Fig. 1. i).
Agric. Journ. India, I., p. 187 (Fig. i).

FIG. 43. DIACRISIA OBLIQUA, larva.

Male 42—58 m.m. Female 50—66 m.m. Pale buff; forewing with black striæ and points; hindwing with black spots. Wings suffused with crimson in *var confusa.* Abdomen crimson with dorsal, lateral and sub-lateral series of black spots. Spots on wings often obsolete. *Var confusa* is chiefly concerned. Distinct by the red suffusion of wings, which is not however universal in all of a brood. The buff colour and spots separate from *Amsacta* below.

FIG. 44. DIACRISIA OBLIQUA.

Distribution.—Japan, China, India, Burma. The variety *confusa*, Bombay, Travancore, Burma (Hmspn.), Behar, Oudh, Balaghat.

Biology.—Eggs in clusters. Larva the typical hairy caterpillar, occurring in swarms. Feed openly, colouration warning. Pupa in cocoon of silk and hairs on soil. Hibernation from November to February. Six broods yearly.

Food Plants.—Labiate weeds, groundnut, mangel wurzel, sunflower, til, jute, sann hemp, cotton, rice, peas, bajra, urad, soy bean, juar, maize, linseed. In swarms fairly omnivorous.

Status.—Locally a serious sporadic pest, one of the major general pests. Destructive principally in sub-Himalayan districts of Behar and Oudh.

Larva.—1 inch. Hairy. Head black. Thoracic segments orange with black blotches. Abdominal segments orange with rounded tubercles dorsally and laterally. Last two segments black.

ARCTIIDÆ—(*contd.*)

233. AMSACTA MOOREI. Butl. Cist. Ent. II, p. 23.
(*Creatonotus*). Hmspn. Lep. Phal. III, p. 329.
Hmpsn. F. Ind. Moths, II, p. 27.
(*Creatonotus*). Indian Museum Notes, V, p. 50.
Indian Insect Pests, p. 193.
Agric. Journ. India, I, p. 187 (Fig. i).

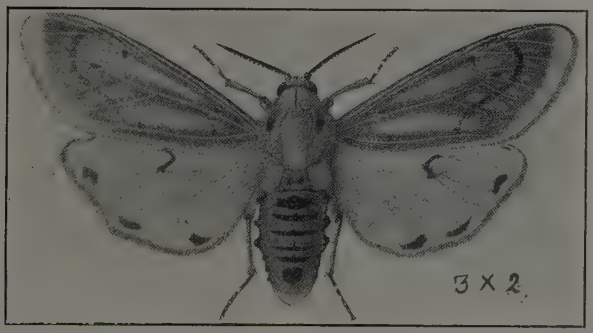

FIG. 45. AMSACTA MOOREI, ×2.

Expanse, male 38—40 ; female 44—54 m. m. White, abdomen scarlet above, with lateral spots and dorsal bands black. Forewing with scarlet costa. Hindwing with black lunule and three black spots. Male antennæ fasciculate.

Distribution.—N.-W. Himalayas, Sind, Bombay, Baroda, Trichinopoly, S. Arcot, Pusa, Ranchi.

Biology.—Larva swarming hairy caterpillar. Pupa in cocoon on soil. Hibernation as pupa ; found in rains.

Food Plant.—Groundnut.

Status.—Minor sporadic pest.

ARCTIIDÆ—(*contd.*)

220. AMSACTA LACTINEA. Cram. Pap. Exot. II, pl. 133.
Hmpsn. Lep. Phal. III, p. 328 (Fig. i).
Hmpsn. F. Ind. Moths, II, p. 27 (Fig. i).
Creatonotus. Indian Museum Notes, III and IV.
(? *A. lineola*). Indian Insect Pests, p. 193 (Fig. i).
Agric. Journ. India., I, p. 187 (Fig. i).

FIG. 46. AMSACTA LACTINEA.

White. Crimson costal fascia to forewing, extending to thorax and coxæ. Abdomen orange above, black bands and lateral spots. A variable number of black spots on the hindwing.

Distribution.—China, Japan, Java, Formosa, India, Burma, Ceylon. In India, plains and hills.

Biology.—Eggs in clusters. Larva a typical hairy caterpillar. Pupa in cocoon of silk and hair on soil. Hibernation as pupa. Found in rains, three to four broods from June to November.

Food Plants.—Sweet potato, sunflower, rice, til, juar, weeds.

Status.—Doubtful. Records in Indian Museum Notes cannot be accepted. Probably *A. lineola* is the species there referred to.

Larva.—$1\frac{1}{2}$ inches. Black with dense tufts of brown hair.

ARCTIIDÆ—(*contd.*)

232. AMSACTA LINEOLA. Fabr. Ent. Syst. III (1), p. 465.
Hmpsn. Lep. Phal. III, p. 324.
(*Creatonotus emittens*), Hmpsn. F. Ind. Moths, II, p. 29.
(*Creatonotus emittens*), Indian Museum Notes, V, p. 57.
Agric. Journ. India, I, p. 187 (Fig. i).

Male 30. Female 38 m. m. White, tinged with pink. A crimson fascia on costa and a black fascia in middle of forewing. Hindwing white. Abdomen crimson, with dorsal series of black spots. Antennæ of male bipectinate.

Distribution.—Throughout India; Ceylon. In India, hills and plains.

Biology.—Typical swarming hairy caterpillar. Pupa on soil in cocoon of silk and hairs. Hibernation as pupa. About three broods in rains.

Food Plant.—Indigo.

Status.—Doubtful. Minor sporadic pest.

ARCTIIDÆ—(*contd.*)

137. UTETHEISA PULCHELLA. Linn. Syst. Nat. I, II, p. 884. Hmpsn. Lep. Phal. III, p. 483 (Fig. i).
(*Deiopia*). Hmpsn. F. Ind. Moths, II, p. 55 (Fig. i). Indian Insect Pests, p. 148 (Fig. 1, i). Agric. Journ. India, I p. 187 (Fig. i)

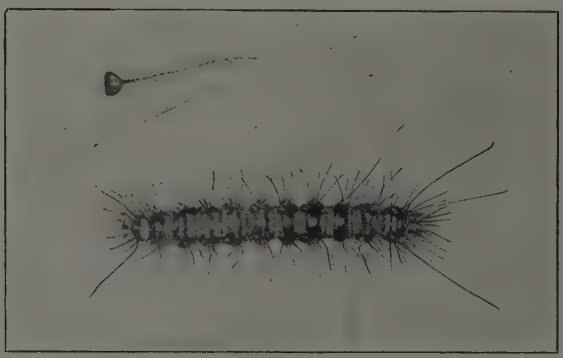

FIG. 47. UTETHEISA PULCHELLA, larva, ×2, and one hair.

Expanse, 40—46 m. m. Forewing white or yellowish white, spotted in red and black. Hindwing white with black patch. Colouring distinctive.

Distribution.—Europe, Africa, Philippines, Malay Archipelago, New Guinea, Australia, India, Burma, and Ceylon. In India, hills and plains.

FIG. 48. UTETHEISA PULCHELLA, ×2½.

Biology.—Eggs in clusters on plant. Typical swarming caterpillar feeding exposed, with warning colouration. Pupa in light cocoon on soil. Hibernation as pupa. Moth day-flying. About six broods yearly if food available.

Food Plant.—Sann hemp.

Status.—Minor sporadic pest, occasionally in swarms.

Larva.—1 inch. Dark above, greenish below. Median dorsal line is yellow white, with brown transverse marks; lateral stripes yellowish with oblique dark marks. Hairs, black above, white below.

NOCTUIDÆ.

90. CHLORIDEA OBSOLETA.—Fabr. Ent. Syst. 3, 1, p. 456.
(*Armigera*). Hmpsn. Lep. Phal. IV, p. 45 (Fig. i).
(*Heliothis armigera*). Hmspn. F. Ind. Moths, II, p. 174 (Fig. i).
" " Haymann, Report of Cawnpore Farm, 1903, p. 19.
" " Indian Museum Notes, I-V, (Fig. l. p. i.).
Indian Insect Pests, p. 144 (Fig. l. p. i.).

FIG. 49. CHLORIDEA OBSOLETA, pupa and imago, ×2.

Expanse, 31—41 m. m. Olive grey to red brown. Forewing with a dark speck and a dark area near the outer margin. Hindwing with a dark outer border. The postmedial line in distinct and strongly dentate. *Distribution.*—Universal. In India, throughout the plains and hills. The bollworm of America.

Biology.—Eggs singly. Larva typically a pod borer, not entering the pod, feeding from outside. Pupa in soil. Hibernation uncertain, does not normally occur except in exceptional cold. In plains active throughout the year. About eight broods in the year.

Food Plants.—Opium, lucerne, gram, mangel wurzel, ganja, peas, indigo, tobacco, tur and other pulse, oats, maize, castor seeds, *Datura stramonium*, onion, tomato, bajra heads, sunflower seeds, carrot. Flower buds of cotton, very rarely.

Status.—A widespread and general pest, rarely serious but causing a large aggregate damage. Occasionally very serious in late rabi crops. Found with swarming caterpillars.

Larva.—1½ inches. Head brown. Thorax and abdomen smooth, general colour greenish, with fine longitudinal lines of black and yellow, making a mid-dorsal and lateral bands. Distinct black papillæ from which rise short white hairs.

NOCTUIDÆ—(*contd.*)

158. CHLORIDEA ASSULTA.—Guen. Noct. II, p. 178.
Hmspn. Lep. Phal. IV, p. 47 (Fig. i).
Ind. Ins. Pests, p. 157.

24—36 m. m. Orange, the postmedial line of forewing distinct.

Distribution.—Asia, Africa, Australia. In India, plains and hills.

Biology.—Like *C. obsoleta.* F.

Food Plants.—Tobacco, tiparee.

Status.—Occasional pest of tobacco.

Larva.—Indistinguishable from C. *obsoleta.* F.

NOCTUIDÆ—(*contd.*)

238. EUXOA SEGETIS.—Schiff. Wien. Verz. pp. 81, 252.
Hmspn. Lep. Phal. IV, p. 167 (Fig. i).
Agrotis, Hmspn. F. Ind. Moths, II, p. 181 (Fig. i).
„ Indian Museum Notes, III, IV, V (Fig. l., p. i).
Indian Insect Pests, p. 288 (Fig. i).
Agric. Journ. India, Vol. II, p. 42 (Fig. i).
Mem. Agric. Dept., Vol. I, No. 3 (Fig. i).

Expanse, 42—48 m. m. Whitish brown or fuscous. Collar with dark line. Markings characteristic but often obscured. Closely similar in general appearance to *Caradrina exigua* but larger, the wing markings dark, not ochreous.

Distribution.—Europe, Africa, Asia. In India, principally a Himalayan and hill form extending into the Ganges valley, and some localities near hills.

Biology.—Larva a surface caterpillar or a swarming caterpillar. Pupa in the ground. Hibernation from December to February.

Food Plants.—Coffee, indigo, weeds.

Status.—Doubtful; in the hills a doubtful general pest.

Larva.—Pale grey, or greyish ochraceous, sometimes pink tinged dorsal, subdorsal and spiracular line usually indicated by dark edges, subdorsal sometimes grey. Head pale with two brown marks. (Meyrick).

NOCTUIDÆ—(*contd.*)

239. EUXOA SPINIFERA.—Hubn. Samml. Eur. Schmett. f. 389.
Hampsn. Lep. Phal. IV, p. 177.
Agrotis biconica, Hampsn. F. Ind., Moths, II, p. 108.
Indian Museum Notes, IV, p. 195.
Indian Insect Pests, p. 188.
Agric. Journ., India, Vol. II, p. 42 (Fig. i).
Mem. Agric Dept., Ent. Vol. I, No. 3 (Fig. i).

26—40 m. m. Two dark fasciæ on the forewing. Hindwing white.

Distribution.—Europe, Africa, Syria, Persia, Kashmir. India, principally the hills and more rarely in the plains.

Biology.—Larva a surface caterpillar. Pupa in soil. Hibernation in colder parts of the plains, December to February.

Food Plants.—Cotton, indigo, tobacco, grasses.

Status.—Occasional minor pest.

Larva.—Closely resembling *A. ypsilon* but browner.

NOCTUIDÆ—(*contd.*)

240. AGROTIS YPSILON.—Roth. Naturf. IX, p. 141.
Hmpsn. F. Ind. Moths, II, p. 182.
Hmpson. Lep. Phal. IV, p. 368 (Fig. i).
(*Suffusa*). Indian Museum Notes, I—V (Figs. 1., p. i).
Indian Insect Pests, p. 188.
Agric. Journ India, Vol. II., p. 42 (Fig. e. l, p. i.).
Mem. Agric. Dept. Ent. Vol. I., No. 3 (Fig. e. l., p. i).

Expanse, 42—56 m. m. Forewing dark, sub-marginal line dentate with two black streaks. Moth darker than the other species, the dentate sub-marginal line distinct.

Distribution.—Almost universal. The "Greasy cutworm" of America. In India, chiefly if not entirely Himalayan and Ganges valley.

Biology.—Eggs singly or in clusters. Larva living in the soil in a burrow from which it emerges to feed. When abundant, forms part of the swarming caterpillars that devastate large areas and then moves from field to field. Pupa in the soil. Hibernation in unusual cold; pupæ do not generally transform in cold weather, but larvæ remain active; pupal hibernation December to February. Number of broods unknown and probably variable according to food supply.

Food Plants.—Tobacco, opium, cabbage, lucerne, mangel wurzel, gram, groundnut, potato, cruciferous vegetables, mustard, linseed, wheat, barley, oats, peas and hops.

Status.—A major pest, destructive to young field crops; chiefly known in rabi crops in Ganges valley, where it also occurs in swarms in late rabi. A "surface caterpillar" and a "swarming caterpillar." Occurrence local, dependent upon parasites, weather and food supply.

Larva.—1½ inches. Smooth with a greasy appearance. Dull grey, lighter below, with small shiny black spots.

NOCTUIDÆ—(*contd.*)

237. AGROTIS FLAMMATRA.—Schiff. Wien. Verz., p. 80.
Hmpsn. Lep. Phal. IV, p. 393.
Hmpsn. F. Ind. Moths, II, p. 189.
(*Ochropleura*). Indian Museum Notes, II, III (Fig. i).
Indian Insect Pests, p. 188 (Fig. i).
Agric. Journ. India, Vol. II, p. 42 (Fig. i).
Mem. Agric. Dept. Vol. I, No. 3 (Fig. i).

Expanse, 56 m. m. Collar with a black triangular mark. Markings characteristic. Hindwing dark.

Distribution.—Europe, Syria, Persia, Siberia, India, Kashmir, Himalayas, Punjab, sub-Himalayan areas.

Biology.—Larva at roots of plants or as a surface caterpillar, rarely swarming. Pupa in the soil. Hibernation December to February.

Food Plants.—Opium, weeds, tobacco.

Status.—A possible pest, scarcely ever reported.

Noctuidæ—(*contd.*)

53. Prodenia Littoralis. Boisd. Faun. Ent. Madag. Lep., p. 91.
Hmpsn. F. Ind. Moths, II, p. 247 (Fig. i).
Indian Museum Notes, II, III, IV (Fig. l., p. i).
Indian Insect Pests, p. 156 (Fig. l., p. i).

Expanse, 30—45 m. m. Forewing marked with ochreous and brown, with a pale blue fascia near apex, often absent. Hindwing white. Markings variable but characteristic.

Distribution.—Tropical and sub-tropical zones. In India, hills and plains, practically universal.

Biology.—Eggs in clusters clothed with hair. Larva leaf-eating, similar to surface caterpillars and forming part of swarming caterpillars. Hibernation in colder parts of the plains as larva or pupa. Imago out in March. Hibernation rarely as imago. Number of broods about eight where food is available, about five in rains with a hibernation brood.

Food Plants.—Tobacco, marua, indigo, castor, Pakur tree (*Ficus infectoria*), lucerne, urid, cabbage, wheat, cauliflower, groundnut, rice, celery, grassroots, tur, sweet potato, sugarcane, coleus, maize; mulberry, potato (Ind. Mus. Notes). When in swarms, fairly omnivorous.

Status.—An important tobacco pest at all stages. A serious swarming caterpillar in late rabi, in indigo or in early monsoon crops. A general major pest.

Larva.—1½ inches. Velvetty black. Head small. Thorax and abdomen with yellow green dorsal lines and a lateral white band. Yellow spot on each segment laterally, variable. Young larva has the junction of thorax and abdomen slightly swollen and dark coloured.

NOCTUIDÆ—(*contd.*)

235. SPODOPTERA MAURITIA.—Boisd. Faun. Ent. Madag. Lep., p. 92.
Hmpsn. F. Ind. Moths, II, p. 248.
Indian Museum Notes, V, p. 48.
E. E. Green, Trop. Agric., 1905, p. 6 (Fig. l., p. i).
Indian Insect Pests, pp. 122, 189.

Expanse, 38 m. m. Fore-tibia with tufts of hair. Forewing grey-brown with a black spot, and an irregularly waved light line. Hindwing white. The tufts of hair on the fore-tibia are a good character. Markings not very distinct.

Distribution—West Africa, Mauritius, Shanghai, Oriental and Australian regions. In India, principally a hill form, abundant locally near hills.

Biology.—Larva a swarming caterpillar, similar to the American "Army worm". Pupa in the soil. Hibernation as pupa.

Food Plants.—Rice, maize, marua, grasses.

Status.—A serious swarming caterpillar, appearing sporadically on rice and neighbouring crops. Distinctly a major pest of occasional occurrence.

Larva.—1½ inches. Grey. Thorax and abdomen smooth, thorax with longitudinal lines. Abdomen with a median reddish band, two longitudinal dorsal lines and a lateral yellow stripe. Crescent shaped black spots on each segment.

NOCTUIDÆ—(*contd.*)

110. CARADRINA EXIGUA.—Hubn. Samml. Eur. Schmett. Noct., Fig. 362.
Hmpsn. F. Ind. Moths, II, p. 259.
(*Laphygma*). Ind. Museum Notes, III, 6, p. 15 (Fig. i).
(*Agrotis segetis*). Ind. M. Notes, V. 3, p. 145 (Fig. l., p. i).
Indian Insect Pests, p. 187 (Fig. l).
Agric. Journ. India, I, p. 338 (Fig. e. l., p. i).

FIG. 50. CARADRINA EXIGUA, larva, ×2.

Expanse, 26—32 m. m. Resembles *Euxoa segetis*, but is smaller. An ochreous spot on the forewing. A series of black sub-marginal specks. Hindwing white, veins and margin fuscous.

Distribution.—Europe, South Africa, North and South America, Oriental region, Honolulu. In India, hills and plains.

Biology.—Eggs in clusters. Larva a swarming caterpillar feeding by day and hiding on the soil in the heat. Pupa in the soil. Life-history very rapid, less than twenty days. Hibernation as pupa.

Food Plants. Lentil (I.M.N.); indigo, cabbage, lucerne, ambadi, jute, maize, bhinda, mangel wurzel, safflower, cotton, amaranths, peas.

Status.—A voracious swarming caterpillar, occurring principally in irrigated crops in March, April. Noticed chiefly when concentrated on small areas.

Larva.—1 inch. Green, a median dorsal and a lateral dark line, on the latter eight white spots and below a lateral yellow line; colour very variable.

NOCTUIDÆ—(*contd*)

114. CIRPHIS LOREYI.—Dup. Lep. Fr. VII, p. 81.
Hmpsn. Lep. Phal. V, p. 492 (Fig. i).
(*Leucania*). Hmpsn. F. Ind. Moths, II, p. 274.
Indian Museum Notes, I, 51.

Expanse, 34—42 m. m. Ochreous. Forewing with a dark suffusion on median nervure; postmedial curved series of specks, white speck at lower angle of cell. The clearer wing, with white spot and postmedial specks distinguish this from *L. unipuncta*.

Distribution.—Europe, India, Burma, Cyelon. In India, hills and plains.

Biology.—Larva leaf-eating or behaving as a surface caterpillar. Pupa in cell in earth. Hibernation unknown.

Food Plants.—Maize, gram.

Status.—A minor pest, status doubtful.

Larva.—1 inch. Brown: a light lateral line, a dark dorsal line. Spots of black and white on the segments.

NOCTUIDÆ—(*contd.*)

29. CIRPHIS UNIPUNCTA.—Haw. Lep. Brit., p. 174.
Hmpsn. Lep. Phal. V, p. 547.
Leucania Hmpsn. F. Ind. II, p. 275.
Leucania extranea Ind. M. Notes, II, III, IV (Fig. l., p. i).
Indian Insect Pests, p. 138 (Fig. l., p. i.).

Expanse, 44—50 m. m. Like *loreyi*, but the forewing with dark specks and blotches, the ground colour often redder; white speck in cell minute; black specks on apical half of wing. Superficially recognizable from *C. loreyi* by the more dusky wing, less distinct white spot and black dots.

Distribution.—Universally distributed. In India, hills and plains. The "Army worm" of the United States and Canada. A pest in Queensland (Tryon).

Biology.—Eggs singly or in clusters. Typically a leaf-eating caterpillar that becomes a swarming caterpillar when abundant. Pupa in soil. Hibernation to March. Appears in hot weather when food is available.

Food Plants.—Juari, maize, rice.

Status.—Injurious to young juari, or to juari and maize at any stage if sufficiently abundant. Very injurious to rice.

Larva.—1 inch. Grey-brown. Prothorax with dark shield and three light lines. A dark lateral stripe on remaining segments. A plate over the base of each sucker foot.

NOCTUIDÆ—(*contd.*)

91. NONAGRIA UNIFORMIS.—Ddgn. Journ. Bo. Nat. Hist. Soc. XV, p. 402.
Indian Museum Notes, V, p. 178 (Fig. l., p. i.).
Indian Insect Pests, p. 123 (Fig. l., p. i.).

FIG. 51.
NONAGRIA UNIFORMIS × 2.
INPERENS.

Expanse, 28 m. m. Ochreous, forewing with a red brown suffusion along median nervure. Marginal dark line. Hindwing white. Antennæ of male fasciculate (cf. N. inferens).

Distribution.—Surat, Nagpur, Behar, Cuttack, Jullundur, Coimbatore. Probably general in the plains.

Biology.—Eggs in clusters. Larva boring in stems. Pupa in the stem. Active in cold weather in plains.

Food Plants.—Cane, juari, wheat, maize, rice, sama, Guinea grass.

Status.—Serious local pest of wheat, somewhat sporadic so far as known. Occasional and general pest of other crops.

Larva.—1 inch. Flesh colour. Head black; prothorax large, with slight dorsal thickening. Anal segment with darker dorsal patch. Rest of body smooth, unstriped.

NOCTUIDÆ—(*contd.*)

152 TARACHE CATENA.—Sow. Brit. Misc., p. 29, pl. xiv.
Hmpsn. F. Ind. Moths, II, p. 312.
Indian Insect Pests, p. 112.

Expanse, 40 m. m. Pure white. Forewing marked with leaden patches. Hindwing pearly with a marginal fuscous band. The white wings with leaden markings are very distinct.

Distribution.—Abyssinia, Natal. In India, Sind, Bombay, Baroda, Coimbatore, Surat, Nagpur, Jhelum and Chenab colonies, Punjab.

Biology.—Larva a typical leaf-eating semi-looper. Found in the rains. Pupa in soil.

Food Plants.—Cotton; maize.

Status.—A minor pest, rarely occurring in large numbers.

Larva.—1 inch. Green or brown. Semi-looper, abdominal 1—2 and anal segments smaller. Thorax with many black speckles, abdomen with orange and black marks on round protuberances on anterior segments. Prolegs on abdomen 5, 6 and anal segment.

NOCTUIDÆ—(*contd.*)

117. ACONTIA MALVÆ.—Esper. Schmett. IV. 2, p. 63.
Hmpsn. F. Ind. Moths, II, p. 322.
Indian Insect Pests, p. 167.

Expanse, 30—36 m. m. Head whitish, thorax canary yellow. Forewing canary yellow with rufous markings. Hindwing white, rarely suffused in part with brown. (Cf. *A. transversa* and *A. intersepta* with specimens.)

Distribution.—Europe, Formosa, India.

Biology.—Larva the typical leaf-eating semi-looper. Pupa in earth in cell of earth and silk. Found in rains and hot weather.

Food Plants.—Bhinda, cotton.

Status.—Minor pest.

Larva.—1 inch. Green, semi-looper. Head large, green with short hairs. Thorax and abdomen green, with minute black markings; round tubercles on each segment with a dark apex and a long hair.

NOCTUIDÆ—(*contd.*)

58. ACONTIA TRANSVERSA.—Guen. Noct. II, p. 211.
Hmpsn. F. Ind. Moths, II, p. 323.
Indian Insect Pests, p. 167.

Expanse, 40—44 m. m. Like *A. malvæ.* Palpi, legs red-brown. Vertex of thorax rufous, male with palpi more hairy in front, tibiæ clothed in long hair.

Distribution.—China, Java, India, Burma, Ceylon.

Biology.—Larva the usual semi-looping leaf-eating caterpillar. Pupa in soil or fold of leaf. Found in rains.

Food Plant.—Bhinda.

Status.—A minor occasional pest.

Larva.—Similar to *A. malvæ.*

NOCTUIDÆ—(*contd.*)

154. EUBLEMMA OLIVACEA. Wlk. Cat. XII, p. 795.
Hmpsn. F. Ind. Moths, II, p. 342.
Indian Insect Pests, p. 166.

Expanse, 22—26 m. m. Forewing white with olive green patches, black specks and some rufous suffusion.

Distribution.—Punjab, Coimbatore, Ceylon, Dharwar, Pusa.

Biology.—Larva bores in green stems and twigs. Pupa in stem, found in rains.

Food Plant.—Brinjal (*Solanum melongena*).

Status.—Minor occasional pest.

NOCTUIDÆ—(*contd.*)

115. COSMOPHILA EROSA.—Hübn. Zutr. Sämml. exot. Schmett. II, 19.
Hmpsn. F. Ind. Moths., II, p. 411.
Haymann, Report of Cawnpore Farm, 1904, p. 21.
Indian Insect Pests, p. 112.

Expanse, 38 m. m. Male: forewing, base orange irrorated with red, apex grey with a purple and orange suffusion; hindwing fuscous. Female: forewing orange with the apical half slightly suffused with purple, basal half with waved brown lines; hindwing orange marginally suffused with fuscous. Markings characteristic, readily recognized.

Distribution.—United States, West Indies, South Africa, Madagascar, Mauritius, Oriental region, Australia; general in the plains.

Biology.—Larva leaf-eating... Pupa in soil or fold of leaf. Found in rains.

Food Plants.—Cotton, ambadi, hibiscus, *Malachra capitata.*

Status.—Sporadic minor pest of cotton.

Larva.—1 inch. Semi-looper. Green with a lateral white streak. Median band of alternating white and dark streaks. Minute white dots laterally at equal distances.

NOCTUIDÆ—(*contd.*)

229. COSMOPHILA SABULIFERA.—Guen. Noct. II, p. 404.
Hmpsn. F. Ind. Moths, II, p. 409.
Indian Insect Pests, p. 151.
Agric. Journ. India, II, p. 109 (Fig. e. l., p. i).

Expanse, 32—38 m. m. Dull earth-brown, with darker spots, suffusion or waved lines on forewing. Colour distinguishes it from *C. erosa*. Markings variable.

Distribution.—Africa, Aden, Ceylon, Burma. India, throughout the plains.

Biology.—Egg singly on leaf, larva a typical leaf-eating semi-looper. Pupa in thin cocoon in soil. Found in rains, more rarely in hot weather.

Food Plant.—Jute.

Status.—A somewhat serious sporadic pest of jute.

Larva.—1½ inches. Semi-looper, one rudimentary, two abdominal and anal sucker feet. Green, with five dark tubercles on each segment bearing short hairs.

NOCTUIDÆ—(*contd.*)

73. EARIAS FABIA.—Stoll. Cram. Pap. Exot. IV, pl. 355.
Hmpsn. F. Ind. Moths, II, p. 133.
Indian Museum Notes, V (Fig 1, p. i).
Haymann, Report of Cawnpore Farm, 1902.
Indian Insect Pests, p. 89 (Fig. 1, p. i).
Agric. Journ. Ind., I, p. 54 (Fig. 1, p. i).

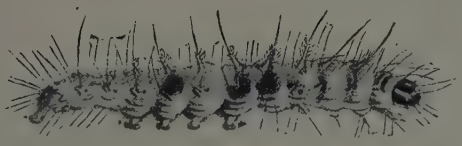

FIG. 52. EARIAS FABIA, larva ×4.

FIG. 53. EARIAS FABIA, ×2.

Expanse, 20—26 m. m. Head and thorax ochreous white, forewing ochreous, with a longitudinal green wedge-shaped band, often absent. Moth recognizable by the ochreous or green striped wings.

Distribution.—Ceylon, Java, throughout the plains of India.

Biology.—Eggs singly. Larva a borer in green stems, pods or bolls. Pupa in cocoon on plant or in soil. Hibernation in colder parts of plains. About eight broods in year when food available, more in warmer localities.

Food Plants.—Cotton, bhinda, ambadi, khanghi and wild malvaceæ.

Status.—Major pest of cotton, universal and constant. Great aggregate damage yearly.

Larva.—¾ inch. Short and thick set. Ground colour whitey-green, an irregular broad lateral blotch of greeny white. Yellow spots laterally on each segment and on thoracic 2·3, abdominal 1 dorsally. One short process on each segment, doubled on thoracic 2·3, abdominal 1, bearing a hair.

NOCTUIDÆ—(*contd.*)

108. EARIAS INSULANA.—Boisd. Faun. Madag., p. 121, pl. 16.
Hmpsn. F. Ind. Moths, II, p. 133, (Fig. i).
Haymann, Report of Cawnpore Farm, 1904, p. 16.
Willcocks Yearbook Khedivial Agric. Soc. 1905.
Indian Insect Pests, p. 89.
Agric. Journ., India, I, p. 54.

Expanse, 20—26 m. m. Head, thorax and forewing green, pale specimens with three angled lines on forewing.

Distribution.—Africa, Mauritius, Baluchistan, Burma, Siam. Throughout the plains of India.

Biology.—Eggs singly. Larva a borer in pods, bolls, and green stems. Pupa in tough cocoon on plant or in soil. Hibernation in colder parts of India. About eight broods a year when food available; more in absence of hibernation.

Food Plants.—Cotton, bhindi, ambadi, khanghi and other malvaceous weeds.

Status.—With *E. fabia*, a major pest of cotton responsible for a large yearly aggregate of loss.

Larva.—Similar to *E. fabia.*

NOCTUIDÆ—(*contd.*)

52. OPHIUSA MELICERTE.—Drury. Ill. Exot. Ins. I, p. 46.
Hmpsn. F. Ind. Moths, II, p. 494.
Indian Museum Notes, I, II, III, V (Fig. l, p. i).
Indian Insect Pests, p. 158 (Fig. l. i.).

FIG. 54. OPHIUSA MELICERTE.

Expanse, 60—70 m. m. Pale reddish brown, wing markings darker, rarely obsolete. Hindwing black with medial band, three marginal spots and cilia white.

Distribution.—Ethiopian, oriental and Australasian regions. In India plains and hills universal.

Biology.—Larva a typical (semi-looper) leaf-eating caterpillar. Pupa in soil. Hibernation occurs the insect being abundant chiefly in the rains.

Food Plants.—Castor; dudhia (*Euphorbia pilulifera*) and probably other Euphorbiaceous weeds.

Status.—A specific pest of castor and as such sporadic and virulent.

Larva. $1\frac{1}{2}$ inches. Semi-looper; colour variable; dark ground with red and white longitudinal stripes. Few hairs. Paired short process on anal segment.

NOCTUIDÆ—(*contd.*)

242. REMIGIA ARCHESIA.—Cram. Pap. Exot. III, pl. 273.
Hmpsn. F. Ind. Moths, II, p. 526.
de Niceville, Indian Museum Notes, V, 126 (Fig. i).

FIG. 55. REMIGIA ARCHESIA.

Expanse, 42—54 m. m. Red-brown. Forewing with darker lines and a lighter submarginal waved line. Hindwing ochreous fuscous with narrow medial and diffused submarginal bands fuscous. Distinct from *frugalis* in colour. Form and marking distinct from all other destructive genera. Moths variable.

Distribution.—Ethiopian and Oriental regions, North China. In India, hills and plains.

Biology.—Larva a leaf-eating semi-looper; pupa in cocoon of leaves and silk on the ground. Hibernation uncertain. Found in the rains.

Food Plants.—Indigo, *Desmodium*, urid.

Status.—A component of the caterpillar swarms on indigo. Sporadic minor pest.

NOCTUIDÆ—(*contd.*)

241. REMIGIA FRUGALIS.—Fabr. Syst. Ent., VI, p. 601.
Hmpsn. F. Ind. Moths, II, p. 527.
Indian Museum Notes, V, p. 137 (Fig. i).

FIG. 56. REMIGIA FRUGALIS.

Expanse, 36—50 m. m. Grey-brown, like *archesia*, but markings variable and often obsolete. Colour distinguishes it from *archesia*.

Distribution.—West Africa, Oriental and Australian regions. In India, principally in and near hills.

Biology.—Larva a leaf-eating semi-looper. Hibernation uncertain. Found in the rains.

Food Plants.—Rice, maize, juari.

Status.—Minor sporadic pest, rarely forming swarms.

Larva.—1½ inches. Grey-brown. Semi-looper, lighter longitudinal stripes. Few short hairs.

NOCTUIDÆ—(*contd.*)

243. GRAMMODES GEOMETRICA.—Fabr. Syst. Ent., p. 599.
Hmpsn. F. Ind. Moths, II, p. 531 (Fig. i).
Indian Museum Notes, V, p. 139 (Fig. i).

Expanse, 35—45 m. m. Grey-brown with striking black and white markings. Hindwing fuscous with medial pale band.

Distribution.—Europe, Africa, Formosa, Java, Australia, India, Burma, Ceylon. In India, hills and near hills.

Biology.—Larva a semi-looping leaf-eater. Hibernation uncertain. Found in rains.

Food Plant.—Rice.

Status.—Minor pest, sporadic. Component of swarming caterpillar masses.

Noctuidæ—(*contd.*)

244. Ophideres fullonica.—Linn. Syst. Nat., I, 2, p. 812.
Hmpsn. F. Ind. Moths, II, p. 560 (Fig. i).
Indian Museum Notes, V, p. 116.
Indian Insect Pests, p. 177.

Head and thorax red-brown suffused with plum colour. Forewing red-brown with faint markings. Hindwing orange with large black markings. Clearly recognizable by the cilia and markings.

Distribution.—Africa, Oriental region to Australia. In India, hills and near hills.

Biology.—Larva feeds on wild plants. Imago found in rains and before cold weather.

Food Plants.—Imago feeds on fruits.

Status.—A minor pest of orange, the imago being destructive to the fruits.

NOCTUIDÆ—(*contd.*)

100. PLUSIA SIGNATA.—Fabr. Ent. Syst., III, 2, p. 31.
Hmpsn. F. Ind. Moths, II, p. 568.
Indian Insect Pests, p. 155 (Fig. l, p. i).

Expanse, 32 m. m. Can be distinguished only by comparison of accurately named specimens.

Distribution.—West Africa, Ceylon, Java, Fiji. In India, Lahore, Surat and Nagpur.

Biology.—Larva a leaf-eating semi-looper. Pupa in cocoon on leaf. No hibernation in plains; found in cold weather.

Food Plants.—Cabbage and other cruciferous vegetables.

Status.—Minor pest of market garden crops.

Larva.—1 inch. Light green. Semi-looper. Head light green, body green, with longitudinal light stripes and short white hairs.

NOCTUIDÆ—(*contd.*)

284. PLUSIA ERIOSOMA.—Doubl. Dieff. New. Zeal., II, p. 285. Hmpsn. F. Ind. Moths, II, p. 569.

Expanse, 42 m. m.

Distribution.—Indian, Malayan, Australian regions, North and South America, China, Japan, Aden, In India, hills and plains.

Biology.—Egg on leaf. Larva leaf-eating. Pupa in a cocoon of silk and leaves. Active throughout the year in the plains, number of broods unknown.

Food Plants.—Sann, urid, marua, moth.

Status.—Minor pest.

Larva.—Over one inch long, green with white stripes and scattered black spots. Semi-looping, three pairs of prolegs.

NOCTUIDÆ—(*contd.*)

190. PLUSIA NIGRISIGNA.—Wlk. Cat. XII, p. 928.
Hmpsn. F. Ind. Moths, II, p. 570.

Expanse, 40 m. m. Can be distinguished only by comparison with accurately named species.

Distribution.—Himalayas, United Provinces, Behar.

Biology.—Larva a pod borer, similar in habits to *Chloridea obsoleta.* Pupa in soil. Found in cold weather. No hibernation in plains.

Food Plants.—Gram, pea, lucerne.

Status.—Minor pest of gram, sporadic.

Larva.—1 inch. Semi-looper, green, two lateral and a dorsal white line. Short hairs.

NOCTUIDÆ.—(*contd.*)

155. PLUSIA ORICHALCEA.—Fabr. Sp. Ins. II, p. 227.
Hmpsn. F. Ind. Moths, II, p. 573.

Expanse, 44 m. m. Red-brown, the outer area of the forewing golden. Hindwing pale, outer area fuscous.

Distribution.—Azores, Madeira, Canaries, St. Helena, South Africa, Mauritius, Arabia, Japan, China, Formosa, India and Ceylon.

Biology.—Larva a leaf-eating semi-looper. Pupa between folds of leaf, a cold weather species, not hibernating.

Food Plants.—Cruciferous vegetables, weeds, and linseed.

Status.—Minor pest of market gardens.

Larva.—1 inch. Green semi-looper. A transparent median line and a white lateral streak.

NOCTUIDÆ—(*concld.*)

PLUSIA AGRAMMA.—Guen. Noct. II, p. 327.
Hmpsn. F. Ind. Moths, II, p. 574.

Expanse, 40 m. m. Grey-brown, the forewing with patches of bronzy reflections and a postmedial sinuous line.

Distribution.—Japan, Ceylon, Java, Australia, Sikkim, Bombay, Canara, Behar.

Food Plants.—Cultivated cucurbitaceæ.

Status.—Minor pest.

Larva.—1½ inch. Green, with two lateral white stripes; longish hairs borne on conspicuous black tubercles. Suckerfeet on abdomen 5—6 and tail only.

PYRALIDÆ.

1. CHILO SIMPLEX. Butl. P. Z. S. 1880, p. 690.
Hmpsn. F. Ind. Moths, IV, p. 26.
Indian Museum Notes (*Diatræa saccharalis* and *Chilo simplex*). I—V, (fig. 1, p. i).
Haymann, Report of the Cawnpore Farm, 1902.
Indian Insect Pests, p. 125 (figs. e, l, p. i).
Agric. Journ., Ind., I, p. 97 (figs. e, l, p. i).

FIG. 57. CHILO SIMPLEX.

Expanse, 22—25 m. m. yellowish-brown, with fuscous suffusion in male and a sub-marginal series of black specks. Hind-wing whitish. The moth is variable in colouration, specially in the relative amount of fuscous on the wings. Male smaller than female, usually darker. The form *partellus* is not distinguishable in the many specimens in the collection.

FIG. 58. CHILO SIMPLEX.

Distribution.—Japan, Chusan, Formosa. In India, general in Bengal, Central Provinces, Bombay, United Provinces, Madras, Punjab. Probably throughout India, Burma and Ceylon.

PYRALIDÆ—(*contd.*)

Life History.—Eggs in clusters on leaves. Typically the larva is a borer, living concealed; distinguishable from other cane borers by its habit of boring into the side of old canes, and by its colouration. Hibernates as a larva or pupa in food plant. Breeds in dry hot weather, dependent upon local food-supply. Generally active from March or earlier to November, with about five broods and a hibernation brood.

Food Plants.—Cane (shoots and canes), maize, (cob) tassel, (stem), juari (stem and shoots), bajra (stem).

Status.—A serious pest to young canes, in the first three months of their growth. Less injurious in old canes, but sometimes abundant. In maize, rarely destructive to the cob and stem. In juari a very serious pest occasionally, destroying the stems of the old plants. One of the most important general pests of India.

Larva.—$\frac{3}{4}$ inch. White with dark specks. Head black, prothoracic shield black. Body whitish, with regular dark tubercles on each segment, bearing hairs. Purple brown pigment arranged in irregular bands.

PYRALIDÆ—(*contd.*)

122. CHILO AURICILIA. Ddgn. Journ., Bo. Nat. Hist. Soc., XV, p. 405.
Ind. Ins. Pests, p. 136.

20—23 m. m. Distinct from *C. simplex* Butl. by the form of the male antennæ ("flattened by coalescing lamellæ separated distinctly"), and by the metallic spots on the forewing. Male smaller and darker. The insect will be accurately recognized only from good unrubbed specimens of the moths, which must be reared. It is probably a hill species which wanders into the sub-montane tracts, and is likely to be found in the Assam and Ganges valley.

Distribution.—Known from Behar where it was first reared by Mr. M. Mackenzie, and from Sikkim, Bhutan and Cuttack.

Life History.—Generally similar to *C. simplex.* In cane, the larvæ and pupæ are indistinguishable from this species.

Food Plants.—Cane, rice.

Status.—A minor pest of cane, which may replace *C. simplex.* Canes may be full of this insect and the two species of *Chilo* occur together in varying numbers.

Larva.—Like *C. simplex.*

PYRALIDÆ—(*contd.*)

133. ANCYLOLOMIA CHRYSOGRAFFELLA. Koll. Hügels Kashmir, IV, p. 294.
Hampson, Fauna of India, Moths, IV, p. 33 (fig. i).

Expanse, male 20—30, female 30—40 m. m. Brownish ochreous. The silvery cilia and fasciæ, the silvery sub-marginal line and dark specks on the marginal white band make the moth easily recognizable in the field. Male antennæ laminated.

Distribution.—South Africa, Aden, Japan, China, Formosa, Penang. Throughout India, Burma, Ceylon.

Life History.—Larva lives in rolled leaf, the pupa on the leaf under the fold; the moth comes to light.

Food Plants.—Rice, probably grasses.

Status.—A minor pest of rice, likely to be occasionally abundant. One of the many casual pests of rice, occurring in any part of India sporadically.

PYRALIDÆ—(*contd.*)

121. SCIRPOPHAGA AURIFLUA.—Zell. Mon. Chil. and Cramb., p. 2.
Hampson, Fauna of India, Moths, IV, p. 46 (fig. i).
Indian Museum Notes, V, p. 174 (fig. l, p. i).
Ind. Ins. Pests, p. 130 (fig. l, p. i).

FIG. 59. SCIRPOPHAGA AURIFLUA.
Larva, pupa in cane, male and female pupa and moth.

Expanse, male 28—30, female 24—50 m. m. Pure white, anal tuft buff, or red outwardly in *Var. intacta.* Moth recognizable by its venation, projecting frons and long palpi; superficially by its pure white wings and buff or red anal tuft.

Distribution.—Congo, Shanghai, Borneo, Java. In India, Burma and Ceylon, throughout the plains and in Sikkim, Bhutan and Kangra.

Life History.—Eggs in clusters covered in hair. The larva is a borer, always eating down to the growing point and into the cane. Pupa in the cane, the exit hole closed by diaphragms spun across. Hibernates as a larva or pupa from November to early March.

Food Plants.—Cane, munj grass.

Status.—A serious pest to cane in Behar and Oudh. Not known as a pest from other parts of India. One of the more important cane pests.

PYRALIDÆ—(*contd.*)

145. SCIRPOPHAGA MONOSTIGMA.—Zell. Mon. Chil and Cramb. 3.
Hampson, Fauna of India, Moths, IV, p. 46.

FIG. 60. SCIRPOPHAGA MONOSTIGMA.

Expanse, 22—30 m. m. Distinct from *S. auriflua* by the black spot in the forewing.

Distribution.—Campbellpur, Bhutan, Behar and probably other submontane localities. Probably a hill form that does not spread far into the plains.

Life History.—Similar to that of *S. auriflua* so far as known.

Food Plants.—Cane and probably grasses.

Status.—A minor pest, found with *S. auriflua* and not important.

PYRALIDÆ—(*contd.*)

146. ANERASTIA ABLUTELLA.—Zell. Ins. 1839, p. 177. Hampson, Fauna of India, Moths, IV, p. 56. Ind. Ins. Pests, p. 136.

Expanse, 13—18 m. m. Ochreous; forewing slightly irrorated with fuscous. Hindwing white. Moth distinct in venation and in the projection of the frons. Not easily recognized.

Distribution.—Mediterranean subregion, Punjab, Behar.

Life History.—Only partly known. Larva a borer in the cane, green in colour, pupa in the ground. Apparently only two broods in the year, with long period of hibernation during the rains and cold weather (M. Mackenzie).

Food Plant.—Cane.

Status.—A local pest to young sugarcane. Might spread and become serious and may already have a wide distribution.

Larva.—1 inch. Bright green.

PYRALIDÆ.—(*contd.*)

149. POLYOCHA SACCHARELLA.—Ddgn. Journ. Bo. Nat. Hist. Soc., XVI, p. 405.
Ind. Ins. Pests, p. 136.

Expanse, 25—34 m. m. Distinct from Anerastia in venation and in the palpi. Superficially like *A. ablutella.* Uniform pale ochreous brown. Forewing of male slightly suffused with fuscous. Hindwing white.

Distribution.—Described from Behar, where it was found by Mr. Mackenzie.

Life History.—Typically a borer in the cane stool. Larva white, pupa in the roots. Hibernation as a larva from November to April (M. Mackenzie).

Food Plant.—Cane.

Status.—A serious local pest to cane. Probably extends into the United Provinces and Bengal, hitherto not found.

PYRALIDÆ—(*contd.*)

2. EUZOPHERA PERTICELLA.—Rag. Nouv. Gen., p. 32. Hampson, Fauna of India, Moths, IV, p. 73 (fig. i). Indian Insect Pests, p. 166.

Expanse, male 26, female 32 m. m. Forewing pale rufous, suffused with grey ; a strongly dentate black line, a fuscous suffusion near apex and a marginal series of black specks. Hindwing white. Moth recognizable superficially by the line on the forewing. Easily distinct from other pests.

Distribution.—Calcutta, Nilgiris, Gujarat, Central Provinces, Behar, Ceylon.

Life History.—Larva a borer in lower part of stem. Pupa in cocoon in stem. Hibernation doubtful.

Food Plant.—Brinjal (*Solanum melongena*).

Status.—A serious local pest. Apparently not widely scattered as a pest and of uncertain distribution in India.

Larva —$\frac{3}{4}$ inch. White, head brown, short hairs.

PYRALIDÆ—(*contd.*)

ETIELLA ZINCKENELLA.—Treitschke. Schmett Eur. CXI, p. 201.
Hampson, F. Ind. Moths, IV, p. 108.
Indian Museum Notes, III, p. 98.

Expanse, 18—30 m. m. Pale rufous. Forewing grey-brown with a white costal fascia and a transverse rufous bar, hindwing with brown suffusions and lines. Distinct from all the genus by the male antennæ. Moth superficially fairly distinct.

Distribution.—Universal. In India, in plains and hills widely scattered.

Life History.—Larva a pod borer.

Food Plants.—Pods of khesari (*Lathyrus sativus*), Sann Hemp (*Crotalaria*), Peas and Saidi beans.

Status.—Minor pest, sporadic.

Larva.—Green with a red dorsal band.

PYRALIDÆ—(*contd.*)

80. PHYCITA INFUSELLA.—Meyr.

Indian Insect Pests, p. 99 (fig. l, p. i).

FIG. 61. PHYCITA INFUSELLA. ×5.

Head, thorax and basal half of wing light grey-brown, apical half darker.

Distribution.—In India, general in the plains.

Life History.—Egg singly on leaf. Larva in webbed leaves of top shoots, pupa in same. No hibernation in plains, throughout the year.

Food Plant.—Cotton.

Status.—Minor pest.

Larva.—$\frac{2}{3}$ inch. Green. Head black. Prothorax dark. Body green with fine waved lines of brown pigment. Dark tubercles bearing short hairs.

PYRALIDÆ—(*contd.*)

NYMPHULA FLUCTUOSALIS.—Zell. K. Vet. Ak. Hindl. 1852, p. 27.
Hampson, F. Ind. Moths, IV, p. 193 (fig. i).
Wood-Mason, Rice Pest of Burma (fig. l).

Expanse, 16—20 m. m. White, with black markings ; wings white, with fulvous black bands curved across both wings. The form of the palpi and the venation distinguish the genus.

Distribution.—Tropical and sub-tropical zones. In India, a plain and hill form.

Life History.—Wood-Mason's account probably refers to this species : Larva semi-aquatic in a case of rice leaves. Pupa semi-aquatic.

Food Plant.—Rice.

Status.—A somewhat serious pest in Burma and Assam. Locally ranks as a major pest and dependent upon very wet conditions.

PYRALIDÆ—(*contd.*)

38. NYMPHULA DEPUNCTALIS.—Guen. Delt. et Pyr., p. 274.
Hampson, Fauna of India, Moths, IV, p. 195.
Indian Insect Pest, p. 121.

Expanse, 16 m. m. White, forewing with a dark spot in cell, two dark discocellular spots. Oblique fulvous band across wing and a sub-marginal fulvous band. Hindwing with two fulvous bands, both wings with a crenulate fulvous line inside margin and a marginal series of specks.

Distribution.—Throughout India, Burma and Ceylon. Java, Australia.

Biology.—Eggs singly on plant. Larva semi-aquatic in case of rolled leaf, active. Pupa in rolled leaf. Found during rains.

Food Plant.—Rice.

Status.—Serious local pest.

Larva.—$\frac{1}{2}$ inch. Greenish, with tubular processes on each segment.

PYRALIDÆ—(*contd.*)

123. ZINCKENIA FASCIALIS.—Cram. Pap. Exot., IV, p. 398
Hampson, Fauna of India, Moths, IV, p. 262 (fig. i).
(*Hymenia recurvalis*). Indian Museum Notes, IV, p. 16 (fig. l, p. i).
Ind. Ins. Pests, p. 182 (fig. i).

FIG. 62. ZINCKENIA FASCIALIS. × 3.

Expanse, 24 m. m. Dark brown; forewing with a black edged white band from the inner margin, a white band from the costal margin near apex. Hindwing with a broad white band from costa to near anal angle. Cilia black, white below apex and at middle. Like Z. *perspectalis* but browner and with no antemedial band.

Distribution.—Neotropical, Oriental, Ethiopian, Australian and Palæarctic Asia. In India, general in hills and plains.

Life History.—Larva on leaves, typical leaf-eating pyralid larva. Pupa in rolled leaf. Hibernation doubtful, moth appears in March, about six broods before the winter.

Food Plants.—Amaranthus, beetroot, maize. Probably many wild plants.

Status.—Chiefly as a pest on irrigated vegetable crops in the hot weather, in company with other larvæ. Occasional pest in rains. A sporadic minor pest.

Larva.—$\frac{5}{8}$ inch. Green, two lateral white streaks. Crescent shaped black spots on meso and meta-thorax, below lateral lines.

PYRALIDÆ—(*contd.*)

48. CNAPHALOCROCIS MEDINALIS. Guen. Delt et Pyr., p. 201. Hampson, Fauna of India, Moths, IV, p. 275 (Fig. i). Ind. Ins. Pests, p. 122.

Expanse, 20 mm. Ochreous, the forewing fuscous on costa and outer margin, with two fine fuscous lines. Hindwing with one fuscous line and an outer fuscous suffusion.

Distribution.—Japan, Oriental and Australian regions. In India, in plains.

Life History.—Larva leaf rolling, folding over the narrow blade. Pupa on the leaf. Found so far only in the rains.

Food Plants.—Rice and probably grasses.

Status.—Sporadic minor pest, locally injurious.

PYRALIDÆ—(*contd.*)

210. MARASMIA TRAPEZALIS. Guen. Delt et Pyr., p. 200.
Hampson, Fauna of India, Moths, IV, p. 277 (Fig. i).
Indian Museum Notes, V, p. 141 (Fig. i).
Indian Insect Pests, p.138.

FIG. 63. MARASMIA TRAPEZALIS.

Expanse, 22 mm. Pale ochreous suffused with brown. Both wings suffused outwardly with fuscous and with oblique fuscous lines. Cilia pale, dark marginal line and line through the cilia. Wing markings recognizable. Palpi and venation distinguish it from other genera and species.

Distribution.—Neotropical, Ethiopian, Oriental and Australian regions. In India, Himalayan and Ganges valley.

Life History.—Larva a leaf-roller, living in rolled up blade of leaf. Pupa in rolled up leaf. Hibernation doubtful; found only in rains. Not more than three broods.

Food Plants.—Maize, juari, bajra, cane.

Status.—Minor pest, not seriously injurious and of regular occurrence.

Larva.—$\frac{1}{5}$ inch. Green, head and prothoracic shield brown, short hairs and tubercles.

Pyralidæ—(*contd.*)

116. Dichocrocis punctiferalis.—Guen. Delt et Pyr., p. 320.
Hmpsn. F. Ind. Moths, IV, p. 307 (Fig. i).
(*Conogethes punctiferalis*) Indian Museum Notes, III, 6, p. 17 (Fig. l, p. i).
Indian Insect Pests, p. 159.

Expanse, 24—32 mm. Yellow spotted with black. Both wings with black spots. Recognizable in field from the orange colour and black spots.

Distribution.—Japan, China, Malayan Sub-region, Australia. India, Burma and Ceylon. In plains and hills.

Life History.—Typically the larva is a pod-borer, pupating in a silken covering in the pod. Throughout the year.

Food Plants.—Pods of castor, sunflower heads; cacao pods in Ceylon (Green).

Status.—Minor pest of regular occurrence in varying numbers. Probably very local, depending upon food-supply.

PYRALIDÆ—(*contd.*)

37. SYLEPTA DEROGATA.—Fabr. Syst. Ent., p. 641.
(*Multilinealis*) Guen. Delt et Pyr., p. 337.
(*Multilinealis*) Hmpsn. F. Ind., Moths, IV, p. 334.
(*Synclera Multilinealis*) Indian Museum Notes, IV, V (Fig. i).
(*Multilinealis*) Haymann, Report of Cawnpore Farm, 1904, p. 20.
Indian Insect Pests, p. 96 (Fig. i).

Expanse, 28—40 mm. Yellowish white; both wings with brown lines and markings. Markings distinct and recognizable.

Distribution.—West Africa, East Siberia, Japan, China, Malayan Sub-region, India, Burma, Ceylon. In India, universal in plains and in hills.

Life History.—Egg laid singly on leaf. Larva a leaf-roller, living in rolled up leaves or simply folding over the leaf. Pupa in leaf roll or soil. Active in rains up to November, and in hot weather if food available. Hibernation from November, about five broods normally.

Food Plants.—Cotton, bhindi, hollyhock.

Larva.—1 inch. Transparent shiny green. Head and prothorax brown.

Pyralidæ—(*contd.*)

112. Glyphodes indica.—Saund. Trans. Ent. Soc., 1851, p. 163.
Hmpsn. F. Ind., Moths, IV, p. 360.
(*Eudioptes*) Indian Museum Notes, III, p. 136 (Fig. l, p. i).
Indian Insect Pests, p. 165 (Fig. i).

Fig. 64. Glyphodes indica. ×2.

Expanse, 24—28 mm. Abdomen with anal tuft of long spatulate scales. Forewing nearly white with broad black fascia on costal and outer margin. Hindwing pearly with marginal black band. The anal tuft distinguishes it from *unionalis* and others of the genus. Recognizable in field flying by day on its food plants.

Distribution.—Oriental, Ethiopian, Australian regions. In India, hills and plains.

Life History.—Larva on leaf, under webbing. Pupa on leaf. Occurrence doubtful, probably throughout the year.

Food Plants.—Cucurbitaceous plants generally.

Status.—Minor pest of vegetable crops.

Larva.—1 inch. Transparent green. A stripe of white on each side of middle line ; a minute black spot on thoracic one and two below white stripe. Few long slender colourless hairs on each segment.

PYRALIDÆ—(*contd.*)

109. LEUCINODES ORBONALIS.—Guen. Delt et Pyr., p. 223.
Hampson, Fauna of India, Moths, IV, p. 370 (Fig. i).
Indian Museum Notes, III, p. 110 (Fig. l, p. i).
Indian Insect Pests, p. 166 (Fig. l, i).

FIG. 65. LEUCINODES ORBONALIS.

Expanse, 24 mm. White, forewing with fulvous, black, and ferruginous markings. Hindwing white, with black lines and specks. The only common species of the genus. Easily recognizable in the field from the markings.

Distribution.—South Africa, Java, India, Burma and Ceylon. In India, plains and hills.

Life History.—Essentially a fruit-boring larva, living on the seed and pulp. Pupa in grey silk cocoon on leaf. Hibernation does not occur in the plains, and the insect is active throughout the year. Extreme cold in plains makes larva dormant, but this rarely occurs.

Food Plants.—Brinjal.

Status.—A minor pest of regular occurrence, responsible for a large aggregate damage.

Larva.—$\frac{3}{8}$ inch. Flesh colour. Head brown, prothorax with brown shield. Few short hairs on round dark spots.

PYRALIDÆ—(*contd.*)

196. CROCIDOLOMIA BINOTALIS.—Zell. K. Vet. Ak., Handl. 1852, p. 66.
Hampson, Fauna of India, Moths, IV, p. 372.

Pale ochreous, forewing suffused with fuscous and ferruginous, with black lines and specks, and dark-edged white spots. Hindwing white, outwardly suffused with fuscous. Male with costal tuft of black hair. Not readily distinguished in the field, likely to be confused with *C. suffusalis*.

Distribution.—South Africa, Formosa, Java, Australia. India, Burma, Ceylon. Hill and plain form.

Life History.—Leaf-eating caterpillar, under webbing. Occurrence chiefly in hot weather on vegetable crops. Hibernation uncertain.

Food Plants.—Cabbage, halim (*Lepidium sativum*) and other cruciferous plants.

Status.—Minor pest of hot weather irrigated crops.

Larva.—$\frac{3}{4}$ inch. Green. A medial and a lateral line of yellow white. Short hairs on dark tubercles.

PYRALIDÆ—(*contd.*)

231. MARUCA TESTULALIS.—Geyer. Hübn. Samml. Exot. Schmett, IV, p. 12.
Hampson, Fauna of India, Moths, IV, p. 393 (Fig. i).
Indian Museum Notes, IV, p. 13 (Fig. i).
Indian Insect Pests, p. 149 (Fig. i).

FIG. 66. MARUCA TESTULALIS.

Expanse, 26—30 mm. Fuscous brown. Forewing with a conspicuous black-edged white spot. Hindwing white, with a marginal fuscous band. Easily recognized from other pests by its markings.

Distribution.—Neotropical and Ethiopian, Japan, Oriental and Australian regions. In India, hills and plains.

Life History.—Larva a pod-borer, eating pods of leguminous plants, which it enters. Does not feed from outside. Pupa in the pod. Found in rains. Hibernation uncertain.

Food Plants.—Mung, moth tur. Probably wild leguminosæ.

Status.—Minor pest little known as yet.

Larva.—$\frac{1}{2}$ inch. Green, sometimes with a pink tinge. No lines. Small dark tubercles bearing hairs.

Pyralidæ—(*contd.*)

234. Pachyzancla stultalis.—Wlk. Cat. XVIII, p. 669. Hampson, Fauna of India, Moths, IV, p. 405.

Expanse, 22—28 mm. Ochreous, suffused slightly with fuscous. An inner and outer fuscous line on both wings, the latter waved and dentate with black specks inside, on forewing. Forewing with a submarginal series of black specks. Hindwing with a double dark marginal line.

Distribution.—China, Andamans, Sumatra, Java, Borneo, Celebes, Australia. India, Burma and Ceylon. In plains.

Life History.—Larva webs leaves and lives within. Pupa on the plant. Found in rains, hibernation uncertain.

Food Plant.—Soy beans and probably wild leguminous weeds.

Status.—Minor pest, as yet little known. Probably one of the common sporadic pests.

Larva.—$\frac{2}{3}$ inch. Head and thorax yellow, abdomen green. A black spot on prothorax laterally. Minute hairs.

PYRALIDÆ—(*concld.*)

111. ANTIGASTRA CATALAUNALIS.—Dup. Lep. France, VIII, p. 330.
Hampson, Fauna of India, Moths, IV, p. 412 (Fig. i).
Indian Insect Pests, p. 161.

Expanse, 20 mm. Ochreous, forewing with the veins orange red, the marginal area orange red, cilia black at base, white at tips. Hindwing ochreous, reddish at outer edge. Form and colour easily distinguishes the insect in the field. No other Indian species.

Distribution.—Europe, Syria, Aden, East and West Africa, India, Burma, Ceylon. Common in the plains.

Life History.—Larva webbing leaves together and feeding within. Pupa on the plant. Active from April to November, depending upon food-supply. Usually at least four broods in the rains.

Food Plants.—Til (*Sesamum indicum*).

Status.—A minor pest of general occurrence and some aggregate importance.

Larva.—$\frac{1}{2}$ inch. Nearly white, a touch of creamy green, black speckled. Head black, prothorax dark above. Meso and meta-thorax, two dorsal tubercles with hairs. Abdomen three dorsal tubercles, with hairs, on each segment.

PTEROPHORIDÆ.

72. EXELASTIS ATOMOSA.—Wals. Proc. Zool. Soc. Lond., 1885, p. 885.

(*E. parasita*) Indian Insect Pests, p. 140 (Fig. l, p. i).

FIG. 67. EXELASTIS ATOMOSA. Larva ×3 and bunch of spines.

Distribution.—General in Gujarat, Central Provinces, Behar, Madras and probably throughout the plains.

Life History.—Egg singly on pods. Larva feeding on seeds of leguminous plants not entering the pod. Colour cryptic. Pupa on pod, naked, colour protective. Hibernation does not occur; found principally in cold weather.

FIG. 68. EXELASTIS ATOMOSA.—Resting attitude.

Food Plants.—Tur (*Cajanus indicus*) and Kulthi (*Dolichos lab-lab*).

Status.—Serious local pest, depending upon area sown in crop.

Larva.—½ inch. Green, or green and brown, pubescent. Each segment is clothed in hairs and capitate spines, the latter radiate from regular points or single. Median dorsal line with a slight ridge.

PTEROPHORIDÆ—(*contd.*)

279. SPHENARCHES CAFFER.—Zell. Hand. Kong. Svensk Vet-Ak, 1852, 118.
Indian Museum Notes, II. (Fig. l, p. i).

Expanse, 16 mm. Ochreous brown, wings with lighter bands and dark spots.

Distribution.—Australia, Africa, Japan, Ceylon, Burma. India, Gujarat, Central Provinces, Behar.

Biology.—Egg singly on leaf, larva and pupa exposed on plant. No hibernation in plains, active throughout the year.

Food Plants.—Cultivated cucurbitaceæ. Tur (*Cajanus indicus*). Kulthi (*Dolichos lab-lab*).

Status.—Minor pest.

Larva.—Like *Exelastis atomosa.*

TORTRICIDÆ.

143. EUCELIS CRITICA.—Meyr. Journ. Bo. Nat. Hist. Soc., XVI, p. 587.
Indian Insect Pests, p. 143.

Expanse, 12—14 mm. Grey tinged with fuscous; forewing with fuscous striæ, four black dots and a silvery transverse mark, the apex darker, the cilia pale.

Distribution.—Described from Surat. Found in Gujarat generally, Behar, Nagpur.

Life History.—Larva in webbed leaves of top shoots. Pupa in same. Hibernation occurs. Found only from July to October.

Food Plants.—Tur (*Cajanus indicus*).

Status.—Minor pest of regular occurrence.

Larva.—$\frac{1}{3}$ inch. Orange brown, slightly compressed. Head brown, body with short hairs.

TORTRICIDÆ—(*contd.*)

157. LASPEYRESIA TRICENTRA.—Meyr. Jo. Bo. Nat. Hist. Soc., XVII, p. 734.

Expanse, 11—13 mm. Fuscous, wings irrorated with greyish ochreous, forewing with oblique fuscous costal striæ and three dark points touching the posterior margin.

Distribution.—India, Ceylon, general in the plains.

Life History.—Larva boring in stems. Pupa in stem. Hibernation uncertain.

Food Plants.—Sann Hemp.

Status.—Minor pest.

TINEIDÆ.

74. GELECHIA GOSSYPIELLA.—Saund. Trans. Ent. Soc. Lond., III, p. 284.
Meyr. Jo. Bo. Nat. Hist. Soc., XVI, p. 592.
Haymann, Report of Cawnpore Farm, 1904, p. 17.
Indian Insect Pests, p. 93 (Fig. l, p. i).
Agric. Journ. Ind., I, p. 54 (Fig. l, p. i).

FIG. 69. GELECHIA GOSSYPIELLA.

Expanse, 18 mm. Palpi upturned, sickle shaped. Dark brownish ochreous, the forewing with darker suffusions. Hindwing grey, suffused with fuscous at the apex.

Distribution.—Ceylon. In India, general in cotton districts. Bombay, Sind, Central Provinces, Madras, Bengal, United Provinces, Punjab, Burma (Myitkyina). Probably Straits Settlements and German East Africa.

Biology.—Egg singly on bract. Larva feeds in oily seeds. Pupa in light cocoon in soil or on plant. Hibernation as larva in seed in colder part of plains only. About six broods yearly where food is available.

Food Plant.—Cotton.

Status.—Major pest of cotton, of regular and general occurrence.

Larva.—$\frac{2}{3}$ inch. Smooth, pink or white. Head and prothoracic shield brown. Thorax and abdomen whitish with broad median and lateral pink blotches.

TINEIDÆ—(*contd.*)

79. GNORIMOSCHEMA HELIOPA. LOW.
Meyr. Journ. Bo. Nat. Hist. Soc., XVI, p. 592.
Indian Insect Pests, *p.* 156.

Expanse, 14 mm. Ochreous brown, the forewings with darker fasciæ, the hindwing grey.

Distribution.—Australia, Ceylon. In India, Gujarat, Rungpur, Behar.

Biology.—Larva living in green stems, causing a gall-like swelling. Pupa in the gall. Hibernation does not occur.

Food Plant.—Tobacco.

Status.—A serious pest to tobacco, of regular occurrence.

Larva.—$\frac{1}{3}$ inch. White. Head and prothoracic shield dark. A subdorsal dark tubercle on each segment.

TINEIDÆ—(*contd.*)

3. PLUTELLA MACULIPENNIS. Curt.
Indian Museum Notes, IV, 196 (Fig. l, p. i).
Indian Insect Pests, p. 152 (Fig. l, p. i).

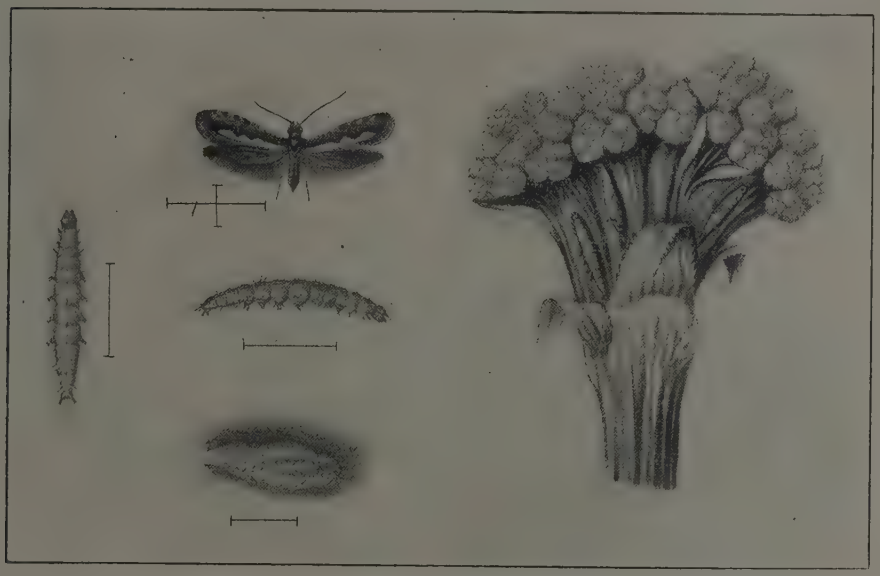

FIG. 69. PLUTELLA MACULIPENNIS.

The wing markings are characteristic, especially when wings are folded.

Distribution.—Europe, Australia. In India, throughout the plains. The Diamond back moth of England and Ireland. The cabbage moth of Australia, Natal, Cape Colony, United States of America.

Life History.—Egg singly on leaf. Larva feeds openly on leaves. Pupa in light net cocoon on leaf. No hibernation in plains.

Food Plants.—Cabbage, rape, mustard, etc. Most cultivated *Cruciferæ*.

Status.—Minor pest of field crops, more important as a pest of market gardens.

Larva.—$\frac{1}{3}$ inch. Green. Head brown, prothorax above brown with black specks. Body green, with red tinge ; dark hairs on light tubercles.

TINEIDÆ—(*concld.*)

272. ANACAMPSIS NERTERIA.—Meyr. Jo. Bo. Nat. Hist. Soc. XVII, p. 139.

Expanse, 10—11 mm. A fuscous moth, with a bronzy tinge; forewings fuscous, bronze tinged, the cilia fuscous; the hindwings and cilia grey.

Distribution.—Ceylon, South India.

Biology.—Egg on leaf singly. Larva between webbed leaf. Throughout the year.

Food Plants.—Groundnut (*Arachis hypogea*).

Status.—Serious local pest.

Larva.—"Dull greenish. Head and prothoracic shield dark brown; spots black." (Green.)

TRYPETIDÆ.

129. DACUS FERRUGINEUS.—Fabr. Ent. Syst. IV.
Indian Museum Notes, II, III, IV (Fig., p. i).
Indian Insect Pests, p. 170 (Fig., p i).

FIG. 71. DACUS FERRUGINEUS.

Red-brown, the thorax marked with black and yellow, the abdomen with yellow. Wings unbanded.

Distribution.—Bengal, United Provinces, Kanara.

Biology.—Egg in skin of fruit. Larva in fruit, pupa in soil. Hibernation in cold months only.

Food Plants.—Mango, Cucurbitaceous fruits, Ak (*Calotropis sp.*).

Status.—Local pest, sporadically abundant.

TRYPETIDÆ—(*contd.*)

130. DACUS CUCURBITÆ. Coq.

Red-brown, the thorax marked with yellow, the abdomen with a black and a white band. Wing with a brown band and apical blotch.

Distribution.—Nasik, Pusa, Hathwa, Surat, Umballa. Probably throughout India.

Biology.—Egg in skin of fruit. Larva in fleshy fruits. Pupa in soil. Hibernation in cold months. Found in hot weather and rains.

Food Plants.—Fruits of Cucurbitaceæ.

Status.—Sporadic pest, occasionally serious.

Trypetidæ—(*concld.*)

218. Carpomyia pardalina.—Big. Indian Museum Notes, II, 51.
Indian Museum Notes, II, III (Fig. i).
Indian Insect Pests, p. 171 (Fig. l, p. i).

Fig. 72. Carpomyia pardalina.
Larva, Pupa, Imago.

Expanse, 11 mm. Wings with three yellowish bands. Colour light brown, thorax with black and white spots.

Distribution.—Baluchistan, Punjab.

Biology.—Egg in skin of fruit. Larva in fleshy fruits. Pupa in soil. Hibernation from September to April (Cleghorn), as pupa. One or two broods, dependent upon food-supply.

Food Plants.—Melon.

Status.—Serious local pest, of regular occurrence.

PENTATOMIDÆ.

223. NEZARA VIRIDULA.—Linn. Syst. Nat. Ed. X, p. 444.
Dist. F. Ind. Rhynch. I, p. 220 (Fig. i).
Indian Museum Notes, I, III.
Indian Insect Pests, p. 168 (Fig. i).

FIG. 73. NEZARA VIRIDULA.

Length, 12—16 mm. Green, rarely with buff markings on head and prothorax. Antennæ brown towards apex.

Distribution.—Palæarctic, Nearctic, Ethiopian regions : part of subtropical, Oriental and Australian regions. Throughout India, but not general. Hills and plains.

Biology.—Eggs on plants, nymph and adult on plants. Found in rains and probably throughout the year. Hibernation doubtful.

Food Plants.—Potato, castor, juar heads, rice ears.

Status.—Minor pest.

PENTATOMIDÆ—(*contd.*)

224. DOLYCORIS INDICUS.—Stol., En. Hem. V, p. 76.
Dist. F. Ind. Rhynch. I, p. 189.
Agonoscelis nubila. Indian Museum Notes, V, pp. 143, 154 (Fig. i).
Agonocelis nubila. Indian Insect Pests, p. 233.

FIG. 74. DOLYCORIS INDICUS.

Length, 10—11 mm.. Ochraceous with black fasciæ and spots. The edge of the abdomen visible from above (Cf. *Agonoscelis*).

Distribution.—Nagas, Calcutta, Mysore, Behar, Deccan, Surat. Probably general in the plains.

Biology.—Nymph and imago on plants, in flowering heads or young grain. Found throughout the year. Hibernation as adult, æstivation as adult; dependent upon food-supply.

Food Plants.—Maize, juar, small millets.

Status.—Minor pest of developing grain. Local and sporadic.

PENTATOMIDÆ—(*contd.*)

169. BAGRADA PICTA.—Fabr., Syst. Ent., p. 715.
Dist. F. Ind. Rhynch. I, p. 193 (Fig. *i*).
(*Apines concinna*). Indian Museum Notes, II, V.
Indian Insect Pests, p. 233 (Fig. i).

FIG. 75. BAGRADA PICTA.

Length, 5—7 mm. Black with ochraceous and red markings.

Distribution.—Hardwar, Calcutta, Tirhoot, Manipur, Bombay, Ceylon, Nagpur.

Biology.—Eggs on leaves, nymph and imago on plant, active. Found throughout the year. Imago survives period of scarcity.

Food Plants.—Mustard, rape, and other cruciferous plants.

Status.—Minor pest, sporadic.

PENTATOMIDÆ—(*concld.*)

207. ANTESTIA CRUCIATA.—Fabr., Syst. Ent., p. 714.
Dist. F. Ind. Rhynch. I, p. 185.
Indian Insect Pests, p. 235.

Length, 7—9 mm. Green to yellow, much spotted with black.

Distribution.—Sikhim, Calcutta, Bombay, Nilgiris, Ceylon, Tenasserim, Malay Archipelago.

Biology.—Imago flying in coffee.

Food Plants.—Coffee berries.

Status.—Minor pest.

COREIDÆ.

266. CLAVIGRALLA HORRENS.—Dohrn., Stett. Ent. Zeit., XXI, p. 403.
Distant, F. Ind. Rhynchota, I, p. 402.

Length, 7 mm. Brownish marked with chestnut. Pronotum spined; femora swollen at the apex.

Distribution.—Bombay, Ceylon, Assam, Burma, Nagpur.

Biology.—Eggs laid on leaves. Nymphs and imago active. No hibernation in plains.

Food Plants.—Tur (*Cajanus indicus*), cultivated leguminosæ.

Status.—Minor pest, local and sporadic.

COREIDÆ—(*contd.*)

103. LEPTOCORISA VARICORNIS.—Fabr. Syst. Rhyng., p. 260.
Distant, F. Ind. Rhynch. I, 409.
Atkinson, Indian Museum Notes, I, p. 1 (Fig. i).
L. *acuta*. Indian Museum Notes, I—V.
Indian Insect Pests, p. 116 (Fig. e, i).

FIG. 76. LEPTOCORISA VARICORNIS. ×2.

Length, 15—17 mm. Green to ochraceous, apical half of second, third and fourth antennal joints darker.

Distribution.—China, Burma, Malay Peninsula and Archipelago. General in India in hills and plains.

Biology.—Eggs on leaves, nymphs and imago in long grass, on flowering grasses and grain heads. Hibernation as an imago in dense vegetation. Found chiefly in rains, reproduction dependent upon food-supply.

Food Plants.—Rice, small millets, flowering grasses.

Status.—Minor pest, rarely becoming serious and abundant

LYGAEIDÆ.

5. OXYCARAENUS LÆTUS.—Kby. J. Linn. Soc., Zool. XXIV, p. 102.
Dist., F. Ind. Rhynch. II, p. 43 (Fig. i).
(*Lugubris*) Indian Museum Notes, II, III (Fig. i).
(*Lugubris*) Haymann, Report of Cawnpore Farm, 1904, p. 19.
Indian Insect Pests, p. 107 (Fig. i).

FIG. 77. OXYCARAENUS LÆTUS. (From Distant).

Length, 4 mm. Dull ash colour, the wings pale grey. Likely to be confused with *O. lugubris*. Motsch.

Distribution.—Calcutta, Ceylon, Burma. General in the plains of Punjab, United Provinces, Bengal, Central Provinces, Bombay Presidency.

Biology.—Eggs in seed capsules. Nymphs and imago in seed capsules. Hibernation as adult in colder parts of India.

Food Plants.—Bhindi, cotton, abutelon, and other garden *Malvaceæ*.

Status.—Rarely serious, usually a general and regular minor pest.

PYRRHOCORIDÆ.

69. DYSDERCUS CINGULATUS.—Fabr. Syst. Ent., p. 719.
Dist., F. Ind. Rhynch. II, p. 119 (Fig. i).
Indian Museum Notes, II, III (Fig. not this species).
Haymann, Report of Cawnpore Farm, 1904, p. 18.
Indian Insect Pests, p. 104 (Fig. i).

FIG. 78.
DYSDERCUS CINGULATUS.
(From Distant).

Length, 9—16 mm. Ochraceous to red; the wing with a black discal spot and membrane; white bands below and on pronotum.

Distribution.—Queensland, Malay Archipelago and Peninsula. Burma, Ceylon; in India, general in hills and plains.

Biology.—Eggs in soil. Nymphs and imago on plants in seed capsules. Hibernation as imago in colder parts of the plains only. Imago lives through periods of scarcity till food-supply enables it to reproduce.

Food Plants.—Cotton, bhinda, hollyhock, silk cotton (*Bombax hibiscus*). Usually oily seeds of *Malvaceæ*.

Status.—Major pest, rarely seriously destructive in any one place but causing a great aggregate loss. General and regular.

CAPSIDÆ.

222. CALOCORIS AUGUSTATUS.—Leth., Indian Museum Notes, III, 2, p. 9 (Fig. l, i).
Dist., F. Ind. Rhynch. II, p. 452.
Indian Insect Pests, p. 236 (Fig. i).

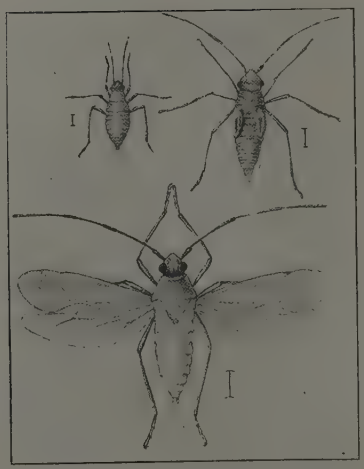

FIG. 79. CALOCORIS AUGUSTATUS.
Nymphs and imago.

Length, 6—7 mm. Dull green.

Distribution.—South Arcot, Coimbatore.

Biology.—Nymph and imago in heads of grain. Found in June.

Food Plants.—Juar, bajra (*Pennisetum typhoideum*).

Status.—Minor pest, local and sporadic.

FULGORIDÆ.

4. LIBURNIA PSYLLOIDES.—Leth., Dist. F. Ind. Rhynch. III, p. 484.
(*Delphax psylloides.*) Indian Museum Notes, III, p. 105 (Figs. e, n, i).
(*Delphax psylloides.*) Indian Insect Pests, p. 137 (Fgs. e, n, i).

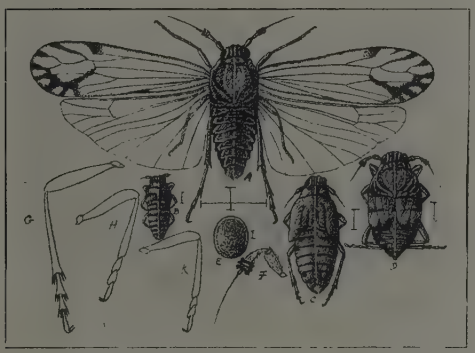

FIG. 81. LIBURNIA PSYLLOIDES.
A. Imago. B.C.D. Nymphs. E. Egg. F. Antenna. G. H. K. legs.

Length, 5 mm. Dull brown, the wings clouded near the apex on the veins.

Distribution.—Described from Ceylon; Surat, Poona, Pusa, Nagpur. Probably general in the plains.

Biology.—Eggs in tissues of plant. Nymphs and imago on plant, gregarious. Hibernation uncertain, found in hot weather and rains.

Food Plants.—Maize and juar.

Status.—Minor pest of young crops.

FULGORIDÆ—(*contd.*)

147. DICTYOPHARA PALLIDA.—Don. Ins. of Ind., 1st Edit., (Fig. i).
Dist. F. Ind. Rhynch. III, p. 243.
Indian Mus. Notes, V (Figs. e, n, i).
Indian Insect Pests, p. 134 (Figs. e, n, i).

FIG. 80. DICTYOPHARA PALLIDA.
Eggs, nymphs, imago, denuded of waxy covering.

Length, 8 mm. Dull orange, the wings with many fine black spots, clouded with black towards the apex.

Distribution.—Arcot, Cawnpore, Tirhoot, Lahore.

Biology.—Eggs in clusters on leaves, nymphs and imagos active on leaf. Throughout the year, no hibernation in the plains.

Food Plants.—Sugarcane, grasses, oats, maize, juar.

Status.—Minor pest, causing black blight.

APHIDES.

162. APHIS BRASSICÆ.—Linn. Syst. Nat., I, II, p. 734.
Indian Insect Pests, p. 239.

Wingless female.—Green, the siphons, tarsi, end of rostrum, apical half of antennæ dark. Siphons long. Cauda long, light coloured.

Winged female.—Head and thorax dark. Abdomen green, black spots at the side. Ends of femora and tibiæ dark. Antennæ dark. Siphons and cauda green.

Distribution.—General in India. Europe and Australia.

Biology.—Throughout the year if food is available. Winged and wingless parthenogenetic generations.

Food Plants.—Sarson, toria and other cruciferous crops and vegetables.

Status.—Major pest, causing great losses to early cruciferous crops.

APHIDES—(*contd.*)

8. APHIS GOSSYPII.—Glov. Rept., U. S. Dept. Agric., 1876, pp. 36, 62.
Pergande. Insect Life, VII, 314.
Agri. Journ. I., p. 50 (Fig. n, i).
Indian Insect Pests, p. 110 (Fig. n, i).

Apterous female.—1·6 mm. Yellow to green. Antennæ pale, apex dark. Siphons black, clothed in a light secretion.

Winged female.—Expanse 5 mm. Dark green, head, antennæ prothorax, spots on abdomen, siphons black.

Distribution.—America, Egypt; India, general in the plains.

Biology.—Throughout the year on cotton when available. Winged and wingless viviparous females only known in India.

Food Plants.—Cotton; elsewhere it has numerous food-plants, and probably has in India, but has not been definitely identified on any but this plant.

Status.—General major pest, of regular occurrence.

APHIDES—(*contd.*)

83. APHIS CARDUI.—L. (var.). Syst. Nat., II, pp. 735, 17. Indian Insect Pests, pp. 150-239.

Winged female.—Shiny black, legs white with ends of tibia black. Antennæ white, basal joint black. Siphons and cauda black.

Wingless female.—Shiny black, legs white, ends of joints dark. Antennæ white, base and apex dark. Siphons and cauda black.

Distribution.—Europe, Behar, Dekhan, Gujarat (probably general in India).

Biology.—Throughout the year. The winged and wingless viviparous parthenogenetic females compose the colonies.

Food Plants.—Tur, indigo, guar, sissoo.

Status.—Minor pest. Sporadically injurious.

APHIDES—(*concld.*)

163. SIPHONOPHORA GRANARIA.—Kby. Trans. Linn. Soc., IV, p. 238 (1798).
Indian Insect Pests, p. 124.

Apterous female.—Green, siphons long and dark, tarsi and antennæ dark. Cauda long, yellow.

Winged viviparous female.—Thorax brown, abdomen green; siphons, antennæ, apices of femora and tibiæ dark.

Distribution.—Europe, Plains of Behar, United Provinces, Central Provinces, Bombay Presidency, Punjab.

Biology.—Active in cold weather. From March to November in doab grass and other thick growing grasses.

Food Plants.—Wheat, barley; oats (rarely).

Status.—Serious pest, of regular occurrence in varying amount.

ALEURODIDÆ.

ALEURODES BARODENSIS.—Mask. Trans. N. Z. Ins., 1895.
Indian Mus. Notes, III-V (Figs. e, n).
Indian Insect Pests, p. 135 (Figs. e, n).

Nymph dark brown, elliptical, margin crenulate, with a broad white fringe.

Distribution.—Baroda, Samalkot, Behar; probably general.

Biology.—Eggs on leaf. Larva, pupa fixed to leaf. Young form active. Hibernation doubtful.

Food Plant.—Cane.

Status.—Major pest of irregular occurrence.

COCCIDÆ.

LECANIUM VIRIDE.—Gre. Ent. Mo. Mag. 1889, p. 248.
Green, Cocc. of Ceylon, III, p. 189.
Indian Museum Notes, I, p. 113.
Indian Insect Pests, p. 244.

Female.—Oval, flattened, green, with a sinuous dorsal black line.

Distribution.—Pulney hills, Nilgiris and Wainaad, South India, Ceylon, West Indies, West Africa, Brazil, Mauritius.

Biology.—Ovo-viviparous females only occur; found throughout the year so long as food is obtainable.

Food Plant.—Coffee. Elsewhere omnivorous.

Status.—A serious pest of coffee.

COCCIDÆ—(*contd.*)

LECANIUM HEMISPHÆRICUM.—Targ. Studi. Sulle. Cocc., p. 27.
Green, Cocc. of Ceylon, III, p. 232 (Fig. n, i).
Indian Museum Notes, I, p. 113.
Indian Insect Pests, p 244.

Female.—Rounded, not flattened, shiny brown, very finely punctate.

Distribution.—Ceylon, S. India, West Indies, United States. Universal in tropics. In temperate regions in greenhouses.

Biology.—Females occur alone, as a rule. Eggs dormant from October to April in hills.

Food Plants.—Coffee. Many cultivated plants.

Coccidæ—(*concld.*)

Dactylopius citri.—Risso. Esai, Hist. Nat. des Oranges.
Indian Museum Notes, V, p. 102.
Indian Insect Pests, p. 245.

Female.—Pink, covered in white mealy wax. No long tail filaments, evenly disposed, short lateral waxy filaments.

Distribution.—Europe, Sandwich Islands, Mauritius, Brazil, West Indies, United States. In India, widely spread.

Biology.—Females below ground on roots, on plant, in ant-shelters. Active throughout the year.

Food Plants.—Coffee, croton.

Status.—Major pest to coffee, of infrequent occurrence.

LIST OF PLANTS.

	Pages.
Abutilon indicum	183, 184, 236.
Akh (*Calotropis*)	227.
Amaranthus	173, 208.
Ambadi (*Hibiscus cannabinus*) ...	173, 181, 183, 184.
Bael (*Aegle marmelos*)	152.
Bajra (*Pennisetum typhoideum*) ...	160, 165, 195, 210, 238.
Bamboo	141.
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